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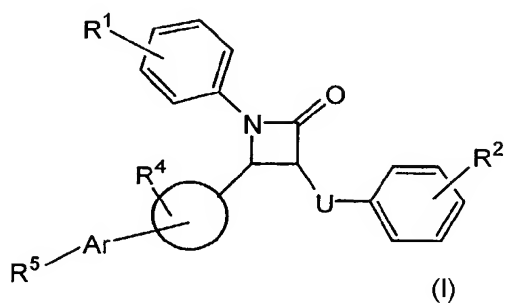
(54) Title: 4-BIARYLYL-1-PHENYLAZETIDIN-2-ONES



(I)

(57) Abstract: 4-Biarylyl-1-phenylazetidin-2-ones useful for the treatment of hypercholesterolemia are disclosed. The compounds are of a general formula (I) in which formula (II) represents an aryl or heteroaryl residue, Ar represents an aryl residue; U is a two to six atom chain; and the R's represent substituents.

4-BIARYLYL-1-PHENYLAZETIDIN-2-ONES

Cross Reference to Related Applications

[0001] This application claims priority from US provisional applications serial numbers 60/518,698; 60/549,577; 60/592,529; and 60/614,005, filed November 10, 2003; March 3, 2004; July 30, 2004; and September 28, 2004, respectively. The entire disclosures of all are incorporated herein by reference.

Field of the Invention

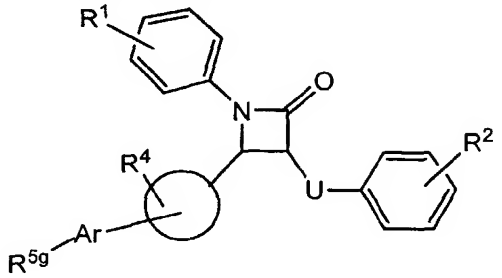
[0002] The invention relates to a chemical genus of 4-biarylyl-1-phenylazetidin-2-ones useful for the treatment of hypercholesterolemia and cholesterol-associated benign and malignant tumors.

Background of the Invention

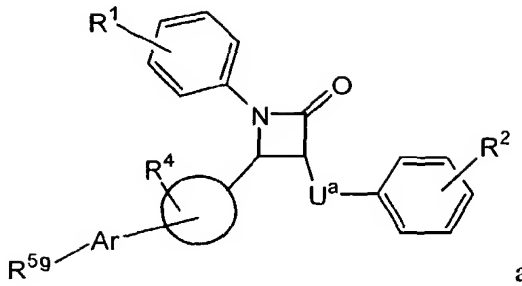
[0003] 1,4-Diphenylazetidin-2-ones and their utility for treating disorders of lipid metabolism are described in US patent 6,498,156, USRE37721 and PCT application WO02/50027, the disclosures of which are incorporated herein by reference as they relate to utility.

Summary of the Invention

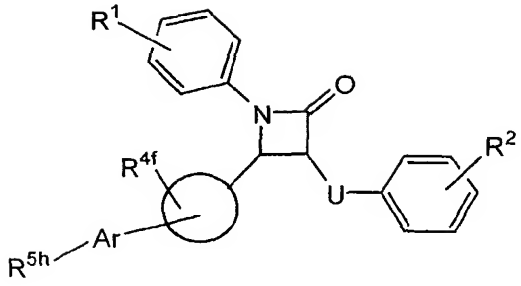
[0004] In one aspect the invention relates to compounds of formula:



which comprises compounds of two closely related genera, Φ and Ψ:



and



Φ Ψ

wherein

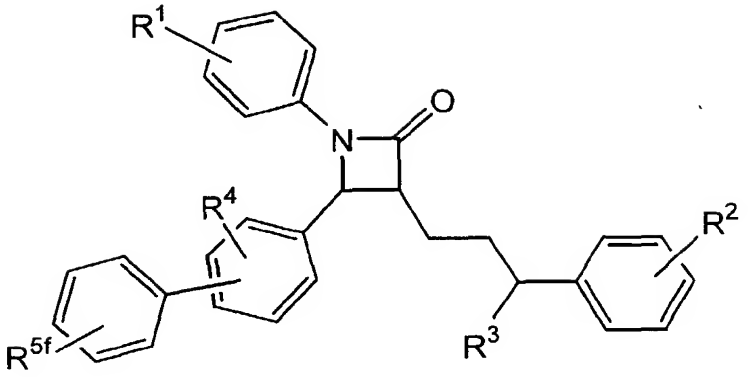
represents an aryl or heteroaryl residue; Ar represents an aryl residue; R^1 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate; R^2 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate; R^4 represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate; R^{4f} is -OH, -SH or -

$B(OH)_2$; R^{5g} represents one, two, three, four or five residues on Ar chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate; R^{5h} represents one, two, three, four or five residues on Ar chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate; U is (C_2-C_6)-alkylene in which one or more $-CH_2-$ may be replaced by a radical chosen from -S-, -S(O)-, $-SO_2-$, -O-, -C(=O)-, -CHOH-, -NH-, CHF, CF_2, -CH(O-loweralkyl)-, -CH(O-loweracyl)-, $-CH(OSO_3H)-$, $-CH(OPO_3H_2)-$, $-CH(OB(OH)_2)-$, or -NOH-, with the provisos that (1) adjacent $-CH_2-$ residues are not replaced by -S-, -S(O)-, $-SO_2-$ or -O-; and (2) -S-, -S(O)-, $-SO_2-$, -O- and -NH- residues are not separated only by a single carbon; U^a is the same as U except that U^a excludes $-CH_2CH_2CH(OH)-$.

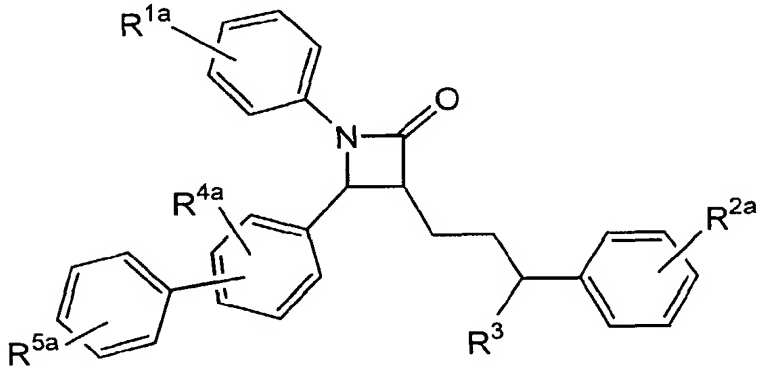
The genera Φ and Ψ exclude compounds in which R^{5g} is -CN; 2,5-dimethoxy; 2,6-dimethoxy or halogen when neither ring of the biphenyl residue is further substituted.

The genera Φ and Ψ also exclude compounds in which R^{5g} is 2-hydroxy when  represents a 2,5-thienyl residue.

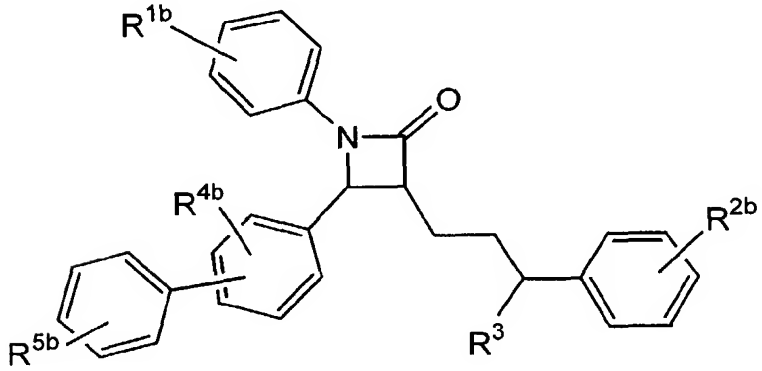
[0005] Subgenera include biphenyl compounds of general formulae **I -VII**:



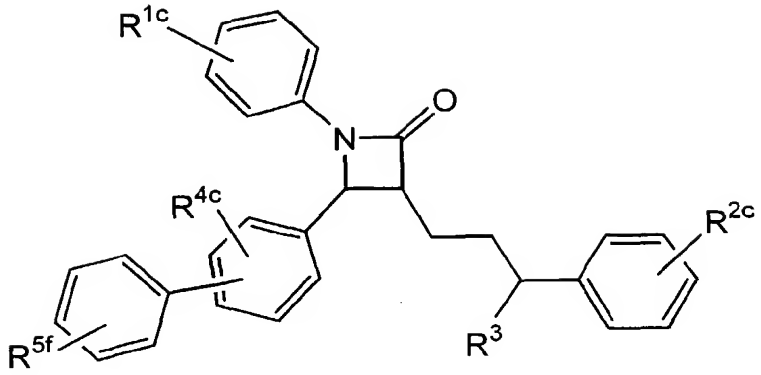
I



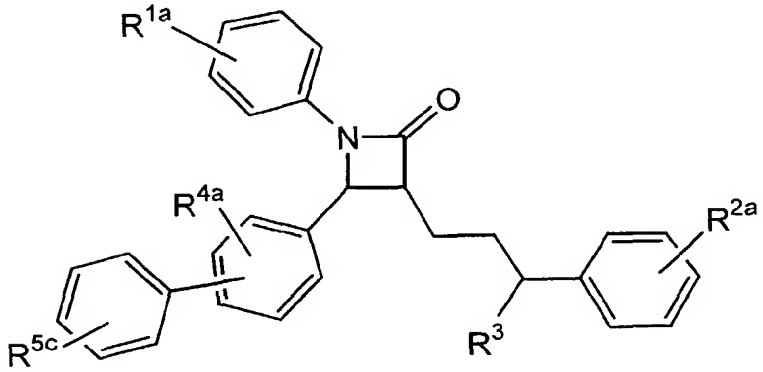
II



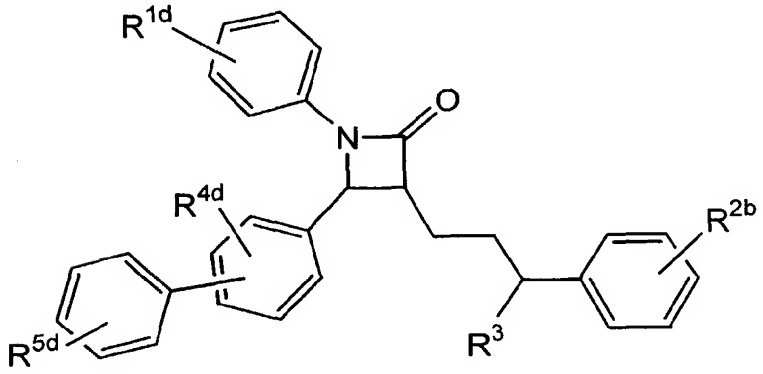
III



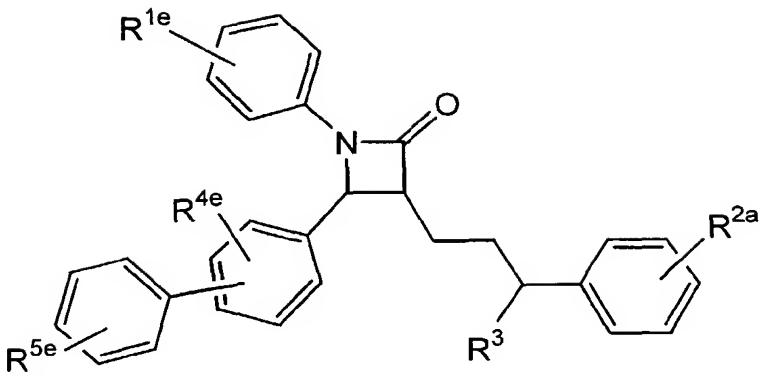
IV



V



VI



VII

[0006] In formula **I**, R^1 and R^2 represent one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide and a sugar carbamate; R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl; R^4 represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide and a sugar carbamate; R^{5f} represents one, two, three, four or five residues chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide a sugar carbamate and $-N^+R^6R^7R^8\ X^-$; R^6 is C_1 to C_{20} hydrocarbon or forms a five- to seven-membered ring with R^7; R^7 is alkyl or forms a five- to seven-membered ring with R^6; R^8 is alkyl or together with R^6 or R^7 forms a second five- to seven-membered ring; and X is an anion.

[0007] In formula **II** one of R^{1a}, R^{4a} and R^{5a} is -Q-A-$N^+R^9R^{10}R^{11}$ X^- and the other two of R^{1a}, R^{4a} and R^{5a} are chosen independently from hydrogen, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy. R^{2a} represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy and benzyloxy. R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl. Q is chosen from a direct bond, -O-, -S-, -NH-, -CH_2O-, -CH_2NH-, -C(=O)-, -CONH-, -NHCO-, -O(C=O)-, -(C=O)O-, -NHCONH-, -OCONH- and -NHCOO-. A is chosen from C_2 to C_{20} hydrocarbon, substituted alkyl of 2 to 20 carbons, substituted aryl, substituted arylalkyl, and oxaalkyl of four to fifty carbons; and, when Q is a direct bond, -C(=O) or –O(C=O)-, A may additionally be methylene. R^9 is C_1 to C_{20} hydrocarbon or forms a five- to seven-membered ring with A or R^{10}; R^{10} is alkyl, forms a double bond with A or forms a five- to seven-membered ring with R^9; R^{11} is alkyl or together with R^{10} or R^9 forms a second five- to seven-membered ring; and X is an anion.

[0008] In formula **III**, R^{2b} represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy. R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl. One of R^{1b}, R^{4b} and R^{5b} is R^{12} and the other two of R^{1b}, R^{4b} and R^{5b} are chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino,

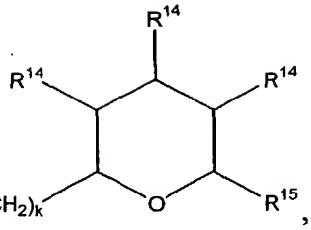
dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide, and a sugar carbamate; R^{12} is (C_0 to C_{30})alkylene-G_n in which one or more -CH_2- residues in said alkylene may be replaced by -S-, -SO-, SO_2-, -O-, -NH-, -N(alkyl)-, -N(phenyl)-, -N(alkylphenyl)-, -N^+(alkyl)$_2$-, -N^+(phenyl)$_2$-, -N^+(alkylphenyl)$_2$-, -C(=O)-, -C(=S), CH=CH-, -C=C-, phenylene or -N[(C=O)alkyleneCOOH]-; G is chosen from -SO_3H, -PO_3H_2, -O-PO_3H_2, -COOH, -C(N=H)NH_2, a polyol, a sugar, a glucuronide, a sugar carbamate, -N^+ $R^{6a}R^{7a}R^{8a}$ X^-, and a mono or bicyclic trialkylammoniumalkyl residue; R^{6a} is C_1 to C_{20} hydrocarbon; R^{7a} is alkyl; R^{8a} is alkyl; n is one, two, three, four or five and X is an anion.

[0009] In compounds of formula **IV**, R^{1c} and R^{2c} represent one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, hydroxyamidino, guanidino, dialkylguanidino, phenyl, benzyl, phenoxy, benzyloxy, a glucuronide, and a sugar carbamate. R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl. R^{4c} represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a glucuronide and a sugar carbamate; and R^{5f} represents one, two, three, four or five residues chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide a sugar carbamate

and - $N^+R^6R^7R^8$ X^-.

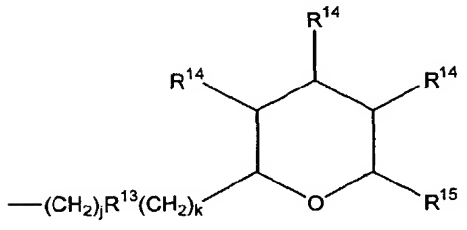
[0010] In compounds of formula V, R^{1a}, R^{2a} and R^{4a} each represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy. R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl. R^{5c} is -Q-A-$N^+R^9R^{10}R^{11}$ X^-; Q is chosen from a direct bond, -O-, -S-, -NH-, $-CH_2O-$, $-CH_2NH-$, -C(=O)-, -CONH-, -NHCO-, $-CH_2NH(C=O)-$, -O(C=O)-, -(C=O)O-, -NHCONH-, -OCONH- and -NHCOO- ; and A is chosen from C_2 to C_{20} hydrocarbon, substituted alkyl of 2 to 20 carbons, substituted aryl, substituted arylalkyl, and oxaalkyl of four to fifty carbons; and, when Q is a direct bond, -C(=O) or –O(C=O)-, A may additionally be methylene.

[0011] In compounds of formula **VI**, R^{2b} represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy. R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl. One of R^{1d}, R^{4d} and R^{5d} is R^{12a} and the other two of R^{1d}, R^{4d} and R^{5d} are chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy and R^{12a};



R^{12a} is $—(CH_2)_jR^{13}(CH_2)_k$, or, when R^{5d} is R^{12a}, R^{12a} may additionally be $(C_0$ to $C_{30})$alkylene-G_n in which one or more -CH_2- residues in said alkylene may be replaced by -S-, -SO-, SO_2-, -O-, -NH-, -N(alkyl)-, -N(phenyl)-, -N(alkylphenyl)-, $-N^+(alkyl)_2$-, $-N^+(phenyl)_2$-, $-N^+(alkylphenyl)_2$-, -C(=O)-, -C(=S), CH=CH-, -C=C-, phenylene or -N[(C=O)alkyleneCOOH]-; G is chosen from $-SO_3H$, $-PO_3H_2$, -O-PO_3H_2, -COOH, $-C(N=H)NH_2$, a polyol, a sugar, a glucuronide, a sugar carbamate, $-N^+R^{6a}R^{7a}R^{8a}X^-$, and a mono or bicyclic trialkylammoniumalkyl residue; R^{13} is chosen from a direct bond, -C=C-, $-OCH_2$, -C(=O)- and -CHOH-; R^{14} is chosen from -OH and -OC(=O)alkyl; R^{15} is chosen from $-CH_2OH$, $-CH_2OC(=O)$alkyl and -COOalkyl; j is 1-5; k is zero or 1-5; and n is 1-5.

[0012] In compounds of formula **VII**, R^{1e}, R^{2a} and R^{4e} each represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCH_3, OCF_2H, OCF_3, CH_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy. R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl. R^{5e} is chosen from



$—(CH_2)_jR^{13}(CH_2)_k$ and $(C_0$ to $C_{30})$alkylene-G_n in which one or more -CH_2- residues in said alkylene may be replaced by -S-, -SO-, SO_2-, -O-, -NH-, -N(alkyl)-, -N(phenyl)-, -N(alkylphenyl)-, $-N^+(alkyl)_2$-, $-N^+(phenyl)_2$-, $-N^+(alkylphenyl)_2$-, -C(=O)-, -C(=S), CH=CH-, -C=C-, phenylene or -N[(C=O)alkyleneCOOH]-.

[0013] In a second aspect the invention relates to pharmaceutical formulations comprising a pharmaceutically acceptable carrier and a compound of the invention having

a pharmaceutically acceptable counter anion and, optionally additionally comprising one or more of (1) an inhibitor of cholesterol biosynthesis; (2) a cholesterol ester transfer protein (CETP) inhibitor; (3) a bile acid sequestrant; (4) a nicotinic acid or derivative thereof; (5) a peroxisome proliferator-activator receptor alpha agonist; (6) an acylcoenzyme A:cholesterol acyltransferase (ACAT) inhibitor; (7) an obesity control medication; (8) a hypoglycemic agent; (9) an antioxidant and (10) an antihypertensive compound.

[0014] In a third aspect, the invention relates to methods for preventing and/or treating a disorder of lipid metabolism, including hyperlipidemia, sitosterolemia and arteriosclerotic symptoms; inhibiting the absorption of cholesterol from the intestine; reducing the blood plasma or serum concentrations of LDL cholesterol; reducing the concentrations of cholesterol and cholesterol ester in the blood plasma or serum; reducing blood plasma or serum concentrations of C-reactive protein (CRP), reducing blood plasma or serum concentrations of triglycerides; reducing blood plasma or serum concentrations of apolipoprotein B; increasing blood plasma or serum concentrations of high density lipoprotein (HDL) cholesterol; increasing the fecal excretion of cholesterol; treating a clinical condition for which a cholesterol absorption inhibitor is indicated; reducing the incidence of cardiovascular disease-related events; reducing plasma or tissue concentration of at least one non-cholesterol sterol or 5α-stanol; treating or preventing vascular inflammation; preventing, treating, or ameliorating symptoms of Alzheimer's Disease; regulating the production or level of at least one amyloid β peptide in the bloodstream and/or brain of a subject; regulating the amount of ApoE isoform 4 in the bloodstream and/or brain; preventing and/or treating obesity; and preventing or decreasing the incidence of xanthomas. The methods comprise administering a compound described herein.

[0015] In a fourth aspect, the invention relates to methods and compositions for prevention or treatment of a cholesterol-associated tumor. The methods comprise administering a therapeutically effective amount of a compound of the invention to a patient at risk of developing a cholesterol-associated tumor or already exhibiting a

cholesterol-associated tumor. The method also includes coadministering a therapeutically effective amount of a compound of the invention and at least one other anticancer agent.

[0016] In a fifth aspect, the invention relates to an article of manufacture comprising a container, instructions, and a pharmaceutical formulation as described above. The instructions are for the administration of the pharmaceutical formulation for a purpose chosen from: the prevention or treatment of a disorder of lipid metabolism; inhibiting the absorption of cholesterol from the intestine; reducing the plasma or tissue concentration of at least one non-cholesterol sterol or 5α-stanol; reducing the blood plasma or serum concentrations of LDL cholesterol; reducing the concentrations of cholesterol and cholesterol ester in the blood plasma or serum; increasing the fecal excretion of cholesterol; reducing the incidence of cardiovascular disease-related events; reducing blood plasma or serum concentrations of C-reactive protein (CRP); treating or preventing vascular inflammation; reducing blood plasma or serum concentrations of triglycerides; increasing blood plasma or serum concentrations of HDL cholesterol; reducing blood plasma or serum concentrations of apolipoprotein B; preventing, treating, or ameliorating symptoms of Alzheimer's Disease; regulating the production of amyloid β peptide; regulating the amount of ApoE isoform 4 in the bloodstream and/or brain; preventing and/or treating obesity; preventing or decreasing the incidence of xanthomas; and preventing or treating a cholesterol-associated tumor.

Detailed description of the Invention

[0017] Compounds of the genus represented by formulae Φ, Ψ, and **I - VII** above are inhibitors of cholesterol absorption from the intestine. As such they have utility in treating and preventing lipid disorders, such as hypercholesterolemia and hyperlipidemia. Because of their effect in lowering serum lipids, the compounds are useful in the treatment and prevention of atherosclerosis. The compounds can be used advantageously in combination with other hypolipidemic agents, including inhibitors of cholesterol biosynthesis, such as HMG-CoA reductase inhibitors. HMG-CoA reductase inhibitors include the "statins": lovastatin, simvastatin, pravastatin, rosuvastatin, mevastatin, atorvastatin, cerivastatin, pitavastatin, fluvastatin, bervastatin, crilvastatin, carvastatin,

rivastatin, sirrivastatin, glenvastatin and dalvastatin. A further listing of non-limiting examples of antihyperlipidemic agents that may be used in combination with the compounds of the present invention may be found in columns 5-6 of US patent 6,498,156, and in PCT WO 04/004778, the disclosures of which are incorporated herein by reference. As described above, the formulation may additionally contain at least one bile acid sequestrant. Sequestrants include cholestyramine, colestipol and colesevelam hydrochloride. The formulation may also contain a nicotinic acid or derivative thereof. Nicotinic acid derivatives include niceritrol, nicofuranose and acipimox. The formulation may also contain a peroxisome proliferator-activator receptor alpha agonist, which may be a fibric acid derivative. Fibric acids include fenofibrate, clofibrate, gemfibrozil, ciprofibrate, bezafibrate, clinofibrate, binifibrate and lifibrol. The formulation may also contain a CETP inhibitor. Examples of such are the compounds identified as JTT-705 in Nature. 406, (6792):203-7 (2000) and CP-529,414 (torcetrapib), described in US20030186952 and WO2000017164. Examples of CETP inhibitors are also found in Current Opinion in Investigational Drugs. 4(3):291-297 (2003). The formulation may also contain an ACAT inhibitor. Examples of such are the compounds identified as avasimibe in Current Opinion in Investigational Drugs. 3(9):291-297 (2003), and CL-277,082 in Clin Pharmacol Ther. 48(2):189-94 (1990). The formulation may also contain an obesity control medication. Examples of obesity control medications include gut hormone fragment peptide YY_{3-36} (PYY_{3-36})(*N. Engl. J. Med.* 349:941, 2003; IKPEAPGE DASPEELNRY YASLRHYLNL VTRQRY) or a variant thereof, glp-1 (glucagon-like peptide-1), exendin-4 (an inhibitor of glp-1), sibutramine, phentermine, phendimetrazine, benzphetamine hydrochloride (Didrex), orlistat (Xenical), diethylpropion hydrochloride (Tenuate), fluoxetine (Prozac), bupropion, ephedra, chromium, garcinia cambogia, benzocaine, bladderwrack (focus vesiculosus), chitosan, nomame herba, galega (Goat's Rue, French Lilac), conjugated linoleic acid, L-carnitine, fiber (psyllium, plantago, guar fiber), caffeine, dehydroepiandrosterone, germander (teucrium chamaedrys), B-hydroxy-β-methylbutyrate, ATL-962 (Alizyme PLC), T71 (Tularik, Inc.; Boulder CO), a ghrelin antagonist, Acomplia (rimonabant), AOD9604, alpha-lipoic acid (alpha-LA), and pyruvate. The formulation may also contain a hypoglycemic agent. Examples of of

classes of hypoglycemic agents include the peroxisome proliferator-activator receptor gamma agonists (including, e.g. rosiglitazone, pioglitazone, ciglitazone; and metformin, phenformin, carbutamide, tolbutamide, acetohexamide, tolazamide, chlorpropamide, glyburide [glibenclamide], glipizide, and gliclazide). The formulation may also contain an antioxidant. Examples of antioxidants include probucol and AGI-1067.

[0018] The formulation may also contain an antihypertensive compound. Examples of classes of antihypertensive compounds include thiazide derivatives, ß-adrenergic blockers, calcium-channel blockers, angiotensin-converting-enzyme (ACE) inhibitor, and angiotensin II receptor antagonists. Examples of thiazide derivatives include hydrochlorothiazide, chlorothiazide, and polythiazide. Examples of ß-adrenergic blockers include atenolol, metoprolol, propranolol, timolol, carvedilol, nadolol, and bisoprolol. Examples of calcium-channel blockers include isradipine, verapamil, nitrendipine, amlodipine,nifedipine, nicardipine, isradipine, felodipine, nisoldipine, and diltiazem. Examples of angiotensin-converting-enzyme (ACE) inhibitors include delapril, captopril, enalopril, lisinopril, quinapril, perindopril, benazepril, trandolapril, fosinopril, ramipril, and ceranapril. Examples of angiotensin II receptor antagonists include candesartan, irbesartan, olmesartan, telmisartan, and aprosartan.

[0019] In one embodiment, the invention comprises a compound of the invention together with a statin. In another embodiment, the invention further comprises an agent chosen from niacin, a sequestrant and a fibrate. In another embodiment, the invention comprises a compound of the invention together with a statin, niacin, a sequestrant and a fibrate.

[0020] The present invention is also directed to methods of prevention or treatment of a cholesterol-associated tumor in patients who are either at risk of developing a cholesterol-associated tumor or already exhibit a cholesterol-associated tumor. The tumor may be either a benign or a malignant tumor of the prostate, breast, endometrium or colon. The compounds of the invention may be co-administered with at least one other anticancer agent, which may be a steroidal antiandrogen, a non-steroidal antiandrogen, an estrogen, diethylstilbestrol, a conjugated estrogen, a selective estrogen receptor modulator (SERM), a taxane, or an LHRH analog. Tests showing the efficacy of the therapy and the

rationale for combination therapy are presented in PCT application WO 2004/010948, the disclosure of which is incorporated herein by reference.

[0021] The compounds of the invention may reduce both cholesterol levels *in vivo* and epoxycholesterol formation and thereby inhibit initiation and progression of benign and malignant cholesterol-associated tumors or cholesterol-associated cell growth or cell-masses. Compositions disclosed herein, for example, are useful for the treatment and/or prevention of benign prostatic hypertrophy, as well as tumors associated with prostate, colon, endometrial, or breast tissues.

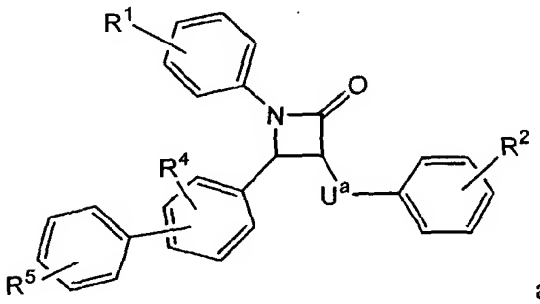
[0022] Compositions of the invention comprise an effective dose or a pharmaceutically effective amount or a therapeutically effective amount of a compound described above and may additionally comprise at least one other anticancer agent, for the treatment or prevention of benign prostatic hypertrophy or other cholesterol-related benign or malignant tumors, particularly those associated with prostate, breast, endometrial or colon tissues. Examples of agents for use in compositions and methods of the invention include steroidal or non steroidal antiandrogens such as finasteride (PROSCAR®), cyproterone acetate (CPA), flutamide (4'-nitro-3'-trifluorormethyl isobutyranilide), bicalutamide (CASODEX®), and nilutamide; estrogens, diethylstilbestrol (DES); conjugated estrogens (e.g., PREMARIN®); selective estrogen receptor modulator (SERM) compounds such as tamoxifen, raloxifene, droloxifene, idoxifene; taxanes such as paclitaxel (TAXOL®) and docetaxel (TAXOTERE®); and LHRH analogs such as goserelin acetate (ZOLADEX®), and leuprolide acetate (LUPRON®).

[0023] Methods of the invention parallel the compositions and formulations. The methods comprise co-administering to a patient in need of treatment a therapeutically effective amount of an azetidinone according to the invention and one or more of: (a) a steroidal or non steroidal antiandrogen; (b) an estrogen; (c) diethylstilbestrol (DES); (d) a conjugated estrogen; (e) a selective estrogen receptor modulator (SERM); (f) a taxane; and (g) an LHRH analog. The term "selective estrogen receptor modulator" includes both estrogen agonist and estrogen antagonists and refers to compounds that bind with the estrogen receptor, inhibit bone turnover and prevent bone loss. In particular, estrogen

agonists are compounds capable of binding to the estrogen receptor sites in mammalian tissue and mimicking the actions of estrogen in that tissue. Estrogen antagonists are compounds capable of binding to the estrogen receptor sites in mammalian tissue and blocking the actions of estrogen in that tissue. Exemplary SERMs are: tamoxifen (U.S. Patent 4,536,516); 4-hydroxytamoxifen (U.S. Patent 4,623,660); raloxifene (U.S. Patent 4,418,068); idoxifene (U.S. Patent 4,839,155; and droloxifene. For the taxanes see U.S. Patents 6,395,770; 6,380,405; and 6,239,167. Azetidinones of the invention may also be combined with a steroidal or non steroidal antiandrogen, as described above.

[0024] Certain compounds of the invention may have the additional advantage that they suppress serum cholesterol and/or LDL levels while themselves not being appreciably absorbed into the mammalian circulation upon oral administration. As a result of the low-to-insignificant serum levels, fewer side-effects, such as drug-drug interactions, are observed.

[0025] Subgenera according to the invention include compounds of formulae Φ and Ψ in which U is chosen from-$CH_2CH_2CH(OH)$-, -SCH_2CH_2-, -$S(O)CH_2CH_2$-, -$SCH_2C(=O)$-, -$SCH_2CH(OH)$-, -$CH(OH)CH_2CH_2$- and -$(CH_2)_4$-, wherein the left end of the string is the point of attachment to the azetidinone ring and the right end of the string is the point of attachment to the phenyl ring. Other subgenera of compounds of formulae Φ and Ψ include ΦA and ΨA



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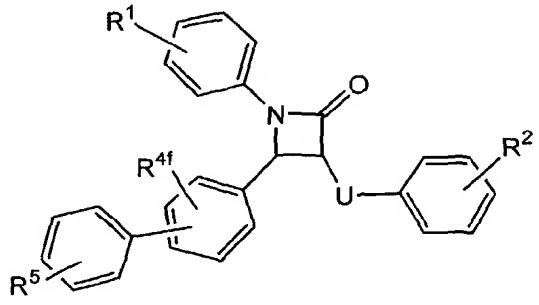
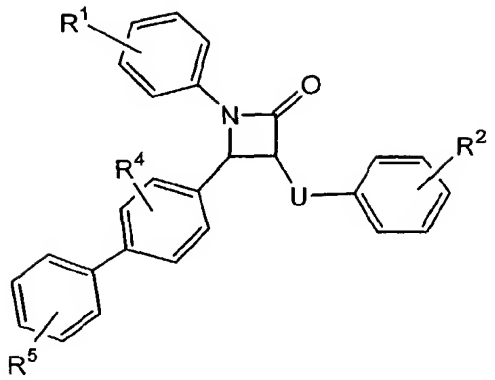


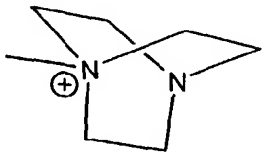
ΦA ΨA

[0026] Futher subgenera include compounds of formulae ΦA and ΨA in which the ring bearing R^5 is in the para position, e.g.:

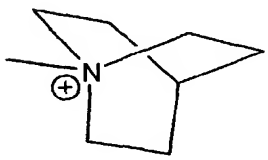


In another subgenus R^1 may be H or 4-fluoro; R^2 may be 4-fluoro; and R^4 may be H or hydroxy. In another subgenus, R^4 and R^5 are both hydroxy.

[0027] Other subgenera according to the invention include compounds in which R^1, R^{1a}, R^2, R^{2a}, R^4 and R^{4a} are chosen independently from H, halogen, -OH, and methoxy; compounds in which R^1, R^2, R^4 and R^5 are chosen from H, a sugar, a glucuronide and a sugar carbamate; compounds in which R^3 is chosen from hydrogen and hydroxy; compounds in which R^4 or R^{4a} is hydrogen; compounds in which R^5 or R^{5a} is chosen from halogen, hydroxy, loweralkyl, -O-loweralkyl, CF_3, alkylsulfonyl and arylsulfonyl. Examples of compounds of formula II include those in which one of R^{1a}, R^{4a} and R^{5a} is -Q-A-$N^+R^9R^{10}R^{11}$ X^- and -Q-A- is chosen from (C_2 to C_{20} hydrocarbon), -O-(C_2 to C_{20} hydrocarbon), -NH(C_2 to C_{20} hydrocarbon), -NHCO(C_2 to C_{20} hydrocarbon) and oxaalkyl of four to twenty carbons. In this series of compounds, R^9,R^{10} and R^{11} are (1) loweralkyl or benzyl, or (2) R^9,R^{10} and R^{11} taken together form a diazabicyclooctane quat:



or (3) R^9,R^{10} and R^{11} taken together form a quinuclidinium quat:



[0028] Some of the compounds of the invention are quaternary salts, i.e. cationic species. Therefore they will always be presented as salts. Other compounds of formula I

may contain basic or acidic residues, allowing them to be presented as salts. In the claims, reference to the acid includes its salts. Thus, for example, a claim to 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid is intended to encompass as well sodium 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonate. The term "pharmaceutically acceptable salt" refers to salts whose counter ion derives from pharmaceutically acceptable non-toxic acids and bases. When the compounds contain a quat or a basic residue, suitable pharmaceutically acceptable base addition salts for the compounds of the present invention include inorganic acids, organic acids and, in the case of quats, water (which formally furnishes the hydroxide anion). Examples include hydroxide, acetate, benzenesulfonate (besylate), benzoate, bicarbonate, bisulfate, carbonate, camphorsulfonate, citrate, ethanesulfonate, fumarate, gluconate, glutamate, glycolate, bromide, chloride, isethionate, lactate, maleate, malate, mandelate, methanesulfonate, mucate, nitrate, pamoate, pantothenate, phosphate, succinate, sulfate, tartrate, trifluoroacetate, p-toluenesulfonate, acetamidobenzoate, adipate, alginate, aminosalicylate, anhydromethylenecitrate, ascorbate, aspartate, calcium edetate, camphorate, camsylate, caprate, caproate, caprylate, cinnamate, cyclamate, dichloroacetate, edetate (EDTA), edisylate, embonate, estolate, esylate, fluoride, formate, gentisate, gluceptate, glucuronate, glycerophosphate, glycolate, glycollylarsanilate, hexylresorcinate, hippurate, hydroxynaphthoate, iodide, lactobionate, malonate, mesylate, napadisylate, napsylate, nicotinate, oleate, orotate, oxalate, oxoglutarate, palmitate, pectinate, pectinate polymer, phenylethylbarbiturate, picrate, pidolate, propionate, rhodanide, salicylate, sebacate, stearate, tannate, theoclate, tosylate, and the like. When the compounds contain an acidic residue, suitable pharmaceutically acceptable base addition salts for the compounds of the present invention include ammonium, metallic salts made from aluminum, calcium, lithium, magnesium, potassium, sodium and zinc or organic salts made from lysine, N,N'-dibenzylethylenediamine, chloroprocaine, choline, diethanolamine, ethylenediamine, meglumine (N-methylglucamine) and procaine. Other base addition salts includes those made from: arecoline, arginine, barium, benethamine, benzathine, betaine, bismuth, clemizole, copper, deanol, diethylamine,

diethylaminoethanol, epolamine, ethylenediamine, ferric, ferrous, glucamine, glucosamine, histidine, hydrabamine, imidazole, isopropylamine, manganic, manganous, methylglucamine, morpholine, morpholineethanol, n-ethylmorpholine, n-ethylpiperidine, piperazine, piperidine, polyamine resins, purines, theobromine, triethylamine, trimethylamine, tripropylamine, trolamine, and tromethamine.

[0029] In certain subgenera of compounds of formulae **III**, **VI** and **VII**, R^{1b} is R^{12} ;R^{2b} and R^{4b} are chosen from H, halogen, -OH, and methoxy; R^{12} is (C_6 to C_{20})alkylene-G in which one or more -CH_2- residues in said alkylene may be replaced by -O-, -NH-, -N(alkyl)-, -C(=O)- or -CH=CH-; and G is chosen from -SO_3H, a polyol, and a sugar. In a further embodiment, R^5 is R^{12} ; R^1, R^2 and R^4 are chosen from H, halogen, -OH, and methoxy; R^{12} is (C_6 to C_{20})alkylene-G in which one or more -CH_2- residues in said alkylene may be replaced by -O-, -NH-, -N(alkyl)-, -C(=O)- or -CH=CH-; and G is chosen from -SO_3H, a polyol, and a sugar.

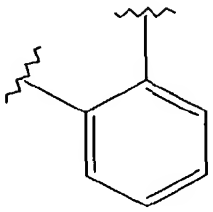
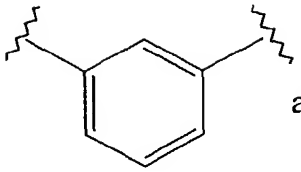
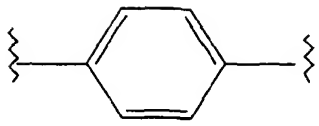
Definitions

[0030] Throughout this specification the terms and substituents retain their definitions.

[0031] Alkyl is intended to include linear, branched, or cyclic hydrocarbon structures and combinations thereof. When not otherwise restricted, the term refers to alkyl of 20 or fewer carbons. Lower alkyl refers to alkyl groups of 1, 2, 3, 4, 5 and 6 carbon atoms. Examples of lower alkyl groups include methyl, ethyl, propyl, isopropyl, butyl, s-and t-butyl and the like. Methyl is preferred. Preferred alkyl and alkylene groups are those of C_{20} or below (e.g. C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}, C_{11}, C_{12}, C_{13}, C_{14}, C_{15}, C_{16}, C_{17}, C_{18}, C_{19}, C_{20}). Cycloalkyl is a subset of alkyl and includes cyclic hydrocarbon groups of 3, 4, 5, 6, 7, and 8 carbon atoms. Examples of cycloalkyl groups include c-propyl, c-butyl, c-pentyl, norbornyl, adamantyl and the like.

[0032] C_1 to C_{20} Hydrocarbon (e.g. C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}, C_{11}, C_{12}, C_{13}, C_{14}, C_{15}, C_{16}, C_{17}, C_{18}, C_{19}, C_{20}) includes alkyl, cycloalkyl, alkenyl, alkynyl, aryl and combinations thereof. Examples include benzyl, phenethyl, cyclohexylmethyl, camphoryl and naphthylethyl. The term "phenylene" refers to ortho, meta or para residues of the

formulae:

  and 

[0033] Alkoxy or alkoxyl refers to groups of 1, 2, 3, 4, 5, 6, 7 or 8 carbon atoms of a straight, branched, cyclic configuration and combinations thereof attached to the parent structure through an oxygen. Examples include methoxy, ethoxy, propoxy, isopropoxy, cyclopropyloxy, cyclohexyloxy and the like. Lower-alkoxy refers to groups containing one to four carbons. Methoxy is preferred.

[0034] Oxaalkyl refers to alkyl residues in which one or more carbons (and their associated hydrogens) have been replaced by oxygen. Examples include methoxypropoxy, 3,6,9-trioxadecyl and the like. The term oxaalkyl is intended as it is understood in the art [see Naming and Indexing of Chemical Substances for Chemical Abstracts, published by the American Chemical Society, ¶196, but without the restriction of ¶127(a)], i.e. it refers to compounds in which the oxygen is bonded via a single bond to its adjacent atoms (forming ether bonds). Similarly, thiaalkyl and azaalkyl refer to alkyl residues in which one or more carbons have been replaced by sulfur or nitrogen, respectively. Examples include ethylaminoethyl and methylthiopropyl.

[0035] Polyol refers to a compound or residue having a plurality of -OH groups. Polyols may be thought of as alkyls in which a plurality of C-H bonds have been replaced by C-OH bonds. Common polyol compounds include for example glycerol, erythritol, sorbitol, xylitol, mannitol and inositol. Linear polyol residues will generally be of the empirical formula $-C_yH_{2y+1}O_y$, and cyclic polyol residues will generally be of the formula $-C_yH_{2y-1}O_y$. Those in which y is 3, 4, 5 and 6 are preferred. Cyclic polyols also include reduced sugars, such as glucitol.

[0036] Acyl refers to groups of 1, 2, 3, 4, 5, 6, 7 and 8 carbon atoms of a straight, branched, cyclic configuration, saturated, unsaturated and aromatic and combinations thereof, attached to the parent structure through a carbonyl functionality. One or more

carbons in the acyl residue may be replaced by nitrogen, oxygen or sulfur as long as the point of attachment to the parent remains at the carbonyl. Examples include formyl, acetyl, propionyl, isobutyryl, *t*-butoxycarbonyl, benzoyl, benzyloxycarbonyl and the like. Lower-acyl refers to groups containing one to four carbons.

[0037] Aryl and heteroaryl refer to aromatic or heteroaromatic rings, respectively, as substituents. Heteroaryl contains one, two or three heteroatoms selected from O, N, or S. Both refer to monocyclic 5- or 6-membered aromatic or heteroaromatic rings, bicyclic 9- or 10-membered aromatic or heteroaromatic rings and tricyclic 13- or 14-membered aromatic or heteroaromatic rings. Aromatic 6, 7, 8, 9, 10, 11, 12, 13 and 14-membered carbocyclic rings include, *e.g.,* benzene, naphthalene, indane, tetralin, and fluorene and the 5, 6, 7, 8, 9 and 10-membered aromatic heterocyclic rings include, *e.g.*, imidazole, pyridine, indole, thiophene, benzopyranone, thiazole, furan, benzimidazole, quinoline, isoquinoline, quinoxaline, pyrimidine, pyrazine, tetrazole and pyrazole.

[0038] Arylalkyl means an alkyl residue attached to an aryl ring. Examples are benzyl, phenethyl and the like.

[0039] Substituted alkyl, aryl, cycloalkyl, heterocyclyl etc. refer to alkyl, aryl, cycloalkyl, or heterocyclyl wherein up to three H atoms in each residue are replaced with halogen, haloalkyl, hydroxy, loweralkoxy, carboxy, carboalkoxy (also referred to as alkoxycarbonyl), carboxamido (also referred to as alkylaminocarbonyl), cyano, carbonyl, nitro, amino, alkylamino, dialkylamino, mercapto, alkylthio, sulfoxide, sulfone, acylamino, amidino, phenyl, benzyl, heteroaryl, phenoxy, benzyloxy, or heteroaryloxy.

[0040] The term "halogen" means fluorine, chlorine, bromine or iodine.

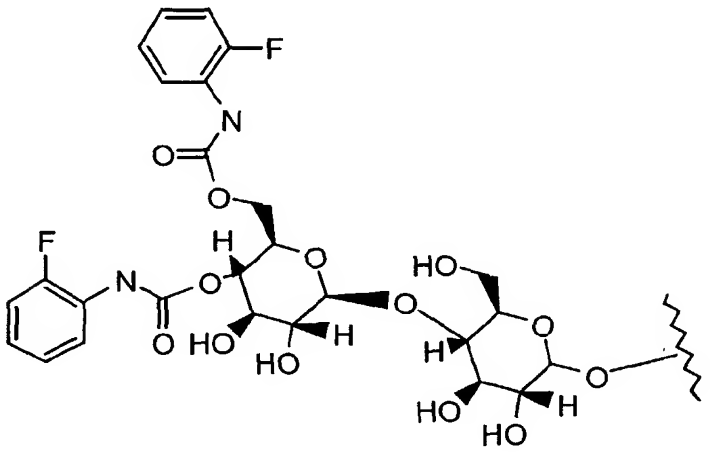
[0041] The term "sugar" is used in its normal sense, as defined in Hawley's Condensed Chemical Dictionary, 12th Edition, Richard J. Lewis, Sr.; Van Nostrand Reinhold Co. New York. It encompasses any carbohydrate comprised of one or two saccharose groups. The monosaccharide sugars (often called simple sugars) are composed of chains of 2-7 carbon atoms. One of the carbons carries aldehydic or ketonic oxygen, which may be combined in acetal or ketal forms. The remaining carbons usually have hydrogen atoms and hydroxyl groups (or protecting groups for hydroxyl, such as acetate). Among monosaccharides which would be considered within the term "sugars"

as intended in this application, are arabinose, ribose, xylose, ribulose, xylulose, deoxyribose, galactose, glucose, mannose, fructose, sorbose, tagatose, fucose, quinovose, rhamnose, manno-heptulose and sedoheptulose. Among the disaccharides are sucrose, lactose, maltose, and cellobiose. Unless specifically modified, the general term "sugar" refers to both D-sugars and L-sugars. The sugar may also be protected. The sugar may be attached through oxygen (as in US patent 5,756,470) or through carbon (as in PCT WO 2002066464), the disclosures of both of which are incorporated herein by reference.

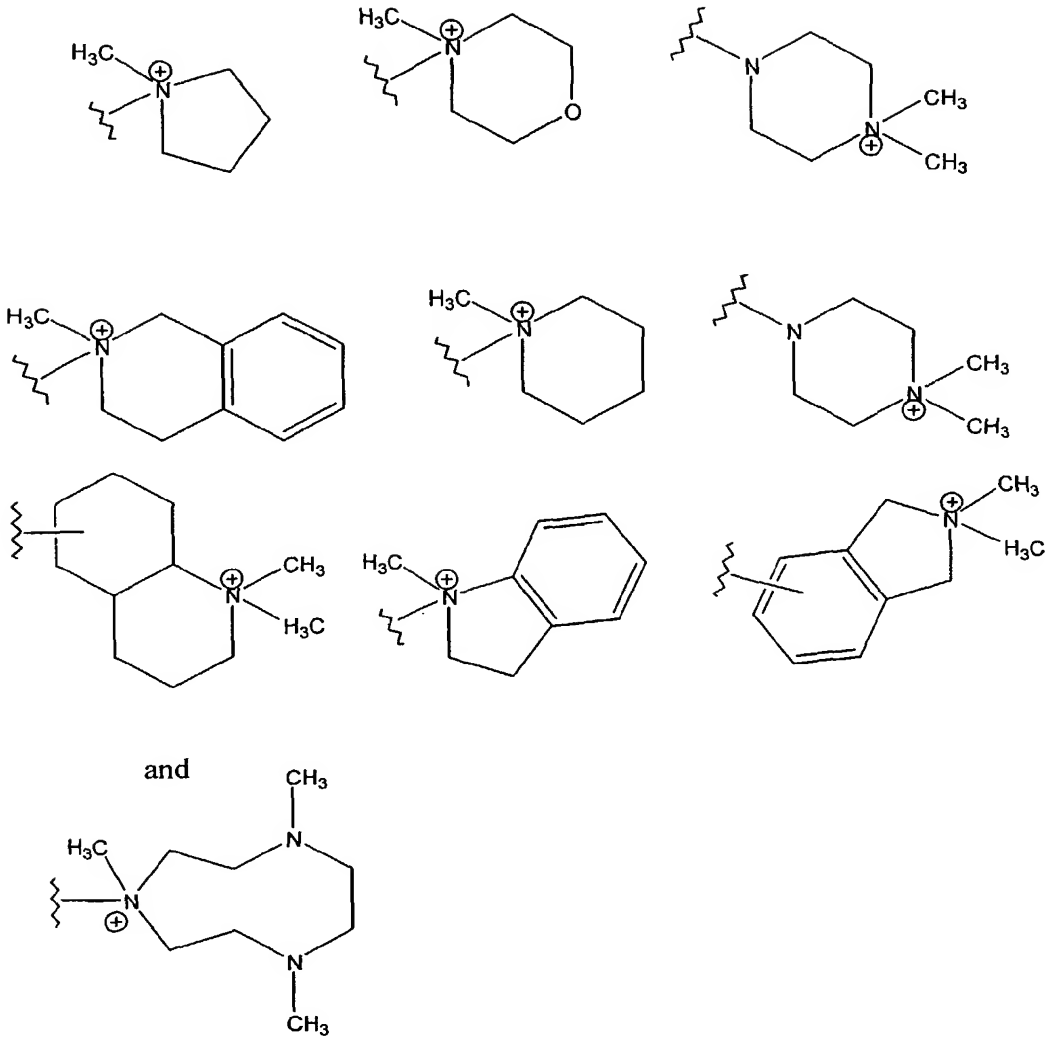
[0042] Reduced C-attached sugars or C-glycosyl compounds are also encompassed by the invention. The reduced sugars (e.g. glucitol), which could be classed either as polyols or as sugars, are also known as alditols. Alditols are polyols having the general formula HOCH2[CH(OH)] nCH2OH (formally derivable from an aldose by reduction of the carbonyl group.

[0043] The term "glucuronide" is also used in its normal sense to refer to a glycoside of glucuronic acid.

[0044] The term "sugar carbamate" refers to mono-, di- and oligosaccharides in which one or more hydroxyls have been derivatized as carbamates, particularly as phenyl carbamates and substituted phenyl carbamates. [See Detmers et al. Biochim Biophys. Acta 1486, 243-252 (2000), which is incorporated herein by reference.] A preferred sugar carbamate is:



[0045] Examples of quats that fall within the definition of monocyclic and bicyclic trialkylammoniumalkyl residues include:



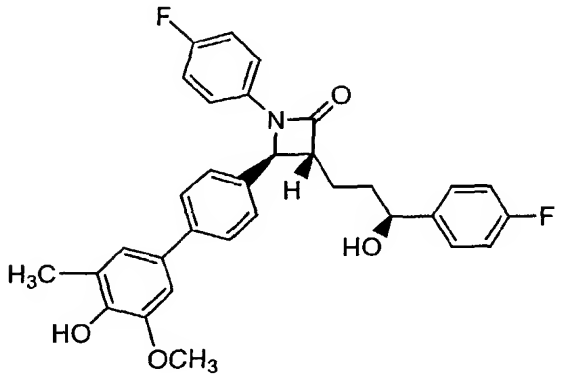
and

[0046] The term "prodrug" refers to a compound that is made more active *in vivo*. Commonly the conversion of prodrug to drug occurs by enzymatic processes in the liver or blood of the mammal. Many of the compounds of the invention may be chemically modified without absorption into the systemic circulation, and in those cases, activation *in vivo* may come about by chemical action (as in the acid-catalyzed cleavage in the stomach) or through the intermediacy of enzymes and microflora in the gastrointestinal GI tract.

[0047] In the characterization of the variables, it is recited that R^9 may form a five- to seven-membered ring with A or R^{10}; that R^{10} may form a double bond with A or may

form a five- to seven-membered ring with R^9; and that R^{11} may form a second five- to seven-membered ring. It is intended that these rings may exhibit various degrees of unsaturation (from fully saturated to aromatic), may include heteroatoms and may be substituted with lower alkyl or alkoxy.

[0048] In the characterization of the variables, it is recited that R-groups, such as R^5, represent one, two, three, four or five residues chosen independently from a list of variable definitions. The structure below illustrates the intent of that language. In this example, R^5 represents three residues: $-CH_3$, -OH and $-OCH_3$.



[0049] The variables are defined when introduced and retain that definition throughout. Thus, for example, R^3 is always chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl, although, according to standard patent practice, in dependent claims it may be restricted to a subset of these values. Superscripts are added to distinguish among residues that are attached similarly and that have overlapping Markush groups. For example, the substituent attached to the phenyl ring at the 1-position (i.e. on the nitrogen) of the azetidinone is always labeled R^1, but can be R^1, R^{1a}, R^{1b} or R^{1c} depending on the members of the Markush group defining it. For simplicity, the dependent claims, when multiply dependent, may refer to R^1 etc. This is intended to modify the appropriate value of the corresponding variable R^1, R^{1a}, R^{1b}, R^{1c} etc. in each claim from which it depends. Thus a claim that recites "a compound according to any of claims 1 to 8 wherein R^1 is chosen from H, halogen, -OH and methoxy" intends to further limit, for example, the corresponding R^{1a} substituent in claim 6, the R^{1b} substituent in claim 7 and the R^{1c}

substituent in claim 8.

[0050] It will be recognized that the compounds of this invention can exist in radiolabeled form, i.e., the compounds may contain one or more atoms containing an atomic mass or mass number different from the atomic mass or mass number usually found in nature. Radioisotopes of hydrogen, carbon, phosphorous, fluorine, and chlorine include ^{3}H, ^{14}C, ^{35}S, ^{18}F, and ^{36}Cl, respectively. Compounds that contain those radioisotopes and/or other radioisotopes of other atoms are within the scope of this invention. Tritiated, i.e. ^{3}H, and carbon-14, i.e., ^{14}C, radioisotopes are particularly preferred for their ease in preparation and detectability. Radiolabeled compounds of Formulas I-VIII of this invention and prodrugs thereof can generally be prepared by methods well known to those skilled in the art. Conveniently, such radiolabeled compounds can be prepared by carrying out the procedures disclosed in the Examples and Schemes by substituting a readily available radiolabeled reagent for a non-radiolabeled reagent.

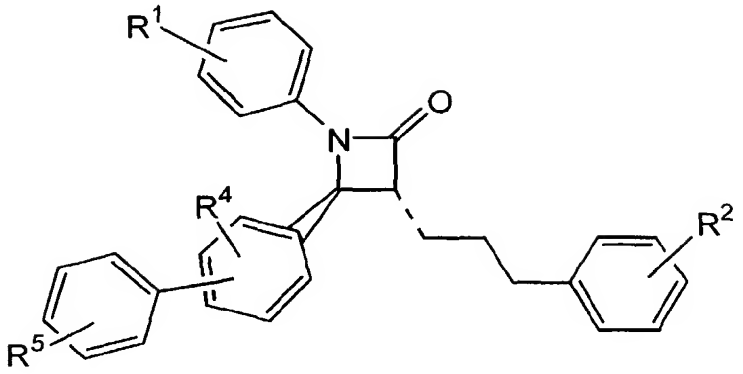
[0051] The terms "methods of treating or preventing" mean amelioration, prevention or relief from the symptoms and/or effects associated with lipid disorders. The term "preventing" as used herein refers to administering a medicament beforehand to forestall or obtund an acute episode or, in the case of a chronic condition to diminish the likelihood or seriousness of the condition. The person of ordinary skill in the medical art (to which the present method claims are directed) recognizes that the term "prevent" is not an absolute term. In the medical art it is understood to refer to the prophylactic administration of a drug to substantially diminish the likelihood or seriousness of a condition, and this is the sense intended in applicants' claims. As used herein, reference to "treatment" of a patient is intended to include prophylaxis. Throughout this application, various references are referred to. The disclosures of these publications in their entireties are hereby incorporated by reference as if written herein.

[0052] The term "mammal" is used in its dictionary sense. The term "mammal" includes, for example, mice, hamsters, rats, cows, sheep, pigs, goats, and horses, monkeys, dogs (e.g., *Canis familiaris*), cats, rabbits, guinea pigs, and primates, including humans.

[0053] The compounds may be use to treat or prevent vascular inflammation, as described in US published application 20030119757; to prevent, treat, or ameliorate symptoms of Alzheimer's Disease and to regulate the production or level of amyloid β peptide and ApoE isoform 4, as described in US patent 6,080,778 and US published application 20030013699; and to prevent or decrease the incidence of xanthomas, as described in US published application 20030119809. The disclosures of all are incorporated herein by reference.

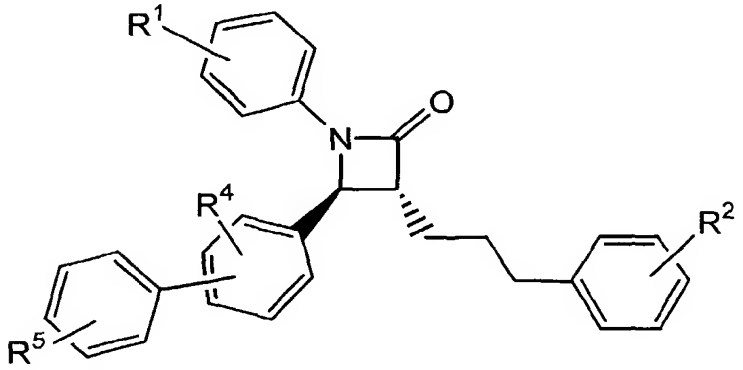
[0054] The compounds described herein contain two or more asymmetric centers and may thus give rise to enantiomers, diastereomers, and other stereoisomeric forms. Each chiral center may be defined, in terms of absolute stereochemistry, as ®- or (S)-. The present invention is meant to include all such possible isomers, as well as, their racemic and optically pure forms. Optically active ®- and (S)-, or (D)- and (L)- isomers may be prepared using chiral synthons or chiral reagents, or resolved using conventional techniques. When the compounds described herein contain olefinic double bonds or other centers of geometric asymmetry, and unless specified otherwise, it is intended that the compounds include both E and Z geometric isomers. Likewise, all tautomeric forms are also intended to be included.

[0055] The graphic representations of racemic, ambiscalemic and scalemic or enantiomerically pure compounds used herein are taken from Maehr J. Chem. Ed. 62, 114-120 (1985): solid and broken wedges are used to denote the absolute configuration of a chiral element; wavy lines and single thin lines indicate disavowal of any stereochemical implication which the bond it represents could generate; solid and broken bold lines are geometric descriptors indicating the relative configuration shown but denoting racemic character; and wedge outlines and dotted or broken lines denote enantiomerically pure compounds of indeterminate absolute configuration. Thus, the formula XI is intended to encompass both of the pure enantiomers of that pair:

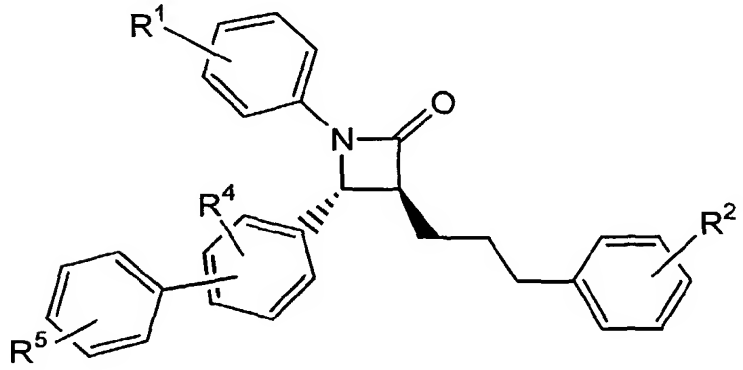


XI

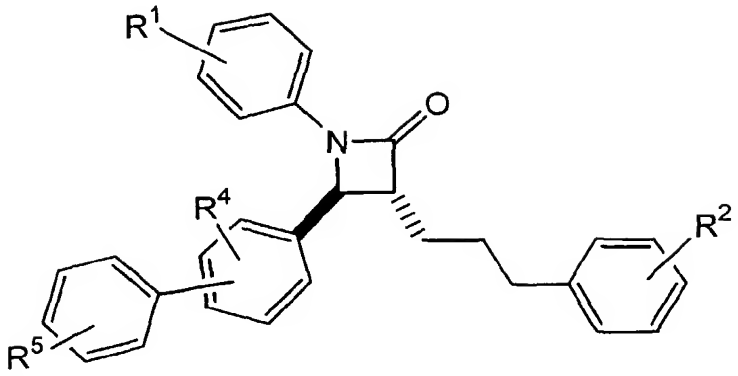
Means either pure R,S:



or pure S,R:



whereas



refers to a racemic mixture of R,S and S,R, i.e. having a *trans* relative configuration on the beta lactam ring.

[0056] The term "enantiomeric excess" is well known in the art and is defined for a resolution of ab into a + b as

$$ee_a = \left(\frac{conc.\ of\ a - conc.\ of\ b}{conc.\ of\ a + conc.\ of\ b} \right) \times 100$$

[0057] The term "enantiomeric excess" is related to the older term "optical purity" in that both are measures of the same phenomenon. The value of ee will be a number from 0 to 100, zero being racemic and 100 being pure, single enantiomer. A compound which in the past might have been called 98% optically pure is now more precisely described as 96% ee; in other words, a 90% ee reflects the presence of 95% of one enantiomer and 5% of the other in the material in question.

[0058] The configuration of any carbon-carbon double bond appearing herein is selected for convenience only and is not intended to designate a particular configuration; thus a carbon-carbon double bond depicted arbitrarily herein as *E* may be *Z*, *E*, or a mixture of the two in any proportion.

[0059] Terminology related to "protecting", "deprotecting" and "protected" functionalities occurs throughout this application. Such terminology is well understood by persons of skill in the art and is used in the context of processes which involve sequential treatment with a series of reagents. In that context, a protecting group refers to a group which is used to mask a functionality during a process step in which it would otherwise react, but in which reaction is undesirable. The protecting group prevents

reaction at that step, but may be subsequently removed to expose the original functionality. The removal or "deprotection" occurs after the completion of the reaction or reactions in which the functionality would interfere. Thus, when a sequence of reagents is specified, as it is in the processes of the invention, the person of ordinary skill can readily envision those groups that would be suitable as "protecting groups". Suitable groups for that purpose are discussed in standard textbooks in the field of chemistry, such as Protective Groups in Organic Synthesis by T.W.Greene [John Wiley & Sons, New York, 1991], which is incorporated herein by reference. Particular attention is drawn to the chapters entitled "Protection for the Hydroxyl Group, Including 1,2- and 1,3-Diols" (pages 10-86).

[0060] The abbreviations Me, Et, Ph, Tf, Ts and Ms represent methyl, ethyl, phenyl, trifluoromethanesulfonyl, toluenesulfonyl and methanesulfonyl respectively. A comprehensive list of abbreviations utilized by organic chemists (i.e. persons of ordinary skill in the art) appears in the first issue of each volume of the Journal of Organic Chemistry. The list, which is typically presented in a table entitled "Standard List of Abbreviations" is incorporated herein by reference.

[0061] While it may be possible for the compounds of formulae Φ, Ψ and **I - VIII** to be administered as the raw chemical, it is preferable to present them as a pharmaceutical composition. According to a further aspect, the present invention provides a pharmaceutical composition comprising a compound of formula Φ, Ψ or **I - VIII** or a pharmaceutically acceptable salt or solvate thereof, together with one or more pharmaceutically carriers thereof and optionally one or more other therapeutic ingredients. The carrier(s) must be "acceptable" in the sense of being compatible with the other ingredients of the formulation and not deleterious to the recipient thereof.

[0062] The formulations include those suitable for oral, parenteral (including subcutaneous, intradermal, intramuscular, intravenous and intraarticular), rectal and topical (including dermal, buccal, sublingual and intraocular) administration. The most suitable route may depend upon the condition and disorder of the recipient. The formulations may conveniently be presented in unit dosage form and may be prepared by any of the methods well known in the art of pharmacy. All methods include the step of

bringing into association a compound of formula Φ, Ψ and **I - VIII** or a pharmaceutically acceptable salt or solvate thereof ("active ingredient") with the carrier, which constitutes one or more accessory ingredients. In general, the formulations are prepared by uniformly and intimately bringing into association the active ingredient with liquid carriers or finely divided solid carriers or both and then, if necessary, shaping the product into the desired formulation.

[0063] Formulations of the present invention suitable for oral administration may be presented as discrete units such as capsules, cachets or tablets each containing a predetermined amount of the active ingredient; as a powder or granules; as a solution or a suspension in an aqueous liquid or a non-aqueous liquid; or as an oil-in-water liquid emulsion or a water-in-oil liquid emulsion. The active ingredient may also be presented as a bolus, electuary or paste.

[0064] A tablet may be made by compression or molding, optionally with one or more accessory ingredients. Compressed tablets may be prepared by compressing in a suitable machine the active ingredient in a free-flowing form such as a powder or granules, optionally mixed with a binder, lubricant, inert diluent, lubricating, surface active or dispersing agent. Molded tablets may be made by molding in a suitable machine a mixture of the powdered compound moistened with an inert liquid diluent. The tablets may optionally be coated or scored and may be formulated so as to provide sustained, delayed or controlled release of the active ingredient therein.

[0065] The pharmaceutical compositions may include a "pharmaceutically acceptable inert carrier", and this expression is intended to include one or more inert excipients, which include starches, polyols, granulating agents, microcrystalline cellulose, diluents, lubricants, binders, disintegrating agents, and the like. If desired, tablet dosages of the disclosed compositions may be coated by standard aqueous or nonaqueous techniques, "Pharmaceutically acceptable carrier" also encompasses controlled release means.

[0066] Compositions of the present invention may also optionally include other therapeutic ingredients, anti-caking agents, preservatives, sweetening agents, colorants, flavors, desiccants, plasticizers, dyes, and the like. Any such optional ingredient must, of course, be compatible with the compound of the invention to insure the stability of the

formulation.

[0067] Examples of excipients for use as the pharmaceutically acceptable carriers and the pharmaceutically acceptable inert carriers and the aforementioned additional ingredients include, but are not limited to:

[0068] BINDERS: corn starch, potato starch, other starches, gelatin, natural and synthetic gums such as acacia, sodium alginate, alginic acid, other alginates, powdered tragacanth, guar gum, cellulose and its derivatives (*e.g.*, ethyl cellulose, cellulose acetate, carboxymethyl cellulose calcium, sodium carboxymethyl cellulose), polyvinyl pyrrolidone, methyl cellulose, pre-gelatinized starch (*e.g.*, STARCH 1500® and STARCH 1500 LM®, sold by Colorcon, Ltd.), hydroxypropyl methyl cellulose, microcrystalline cellulose (*e.g.* AVICEL™, such as, AVICEL-PH-101™, -103™ and -105™, sold by FMC Corporation, Marcus Hook, PA, USA), or mixtures thereof;

[0069] FILLERS: talc, calcium carbonate (*e.g.*, granules or powder), dibasic calcium phosphate, tribasic calcium phosphate, calcium sulfate (*e.g.*, granules or powder), microcrystalline cellulose, powdered cellulose, dextrates, kaolin, mannitol, silicic acid, sorbitol, starch, pre-gelatinized starch, or mixtures thereof;

[0070] DISINTEGRANTS: agar-agar, alginic acid, calcium carbonate , microcrystalline cellulose, croscarmellose sodium, crospovidone, polacrilin potassium, sodium starch glycolate, potato or tapioca starch, other starches, pre-gelatinized starch, clays, other algins, other celluloses, gums, or mixtures thereof;

[0071] LUBRICANTS: calcium stearate, magnesium stearate, mineral oil, light mineral oil, glycerin, sorbitol, mannitol, polyethylene glycol, other glycols, stearic acid, sodium lauryl sulfate, talc, hydrogenated vegetable oil (*e.g.*, peanut oil, cottonseed oil, sunflower oil, sesame oil, olive oil, corn oil and soybean oil), zinc stearate, ethyl oleate, ethyl laurate, agar, syloid silica gel (AEROSIL 200, W.R. Grace Co., Baltimore, MD USA), a coagulated aerosol of synthetic silica (Degussa Co., Plano, TX USA), a pyrogenic silicon dioxide (CAB-O-SIL, Cabot Co., Boston, MA USA), or mixtures thereof;

[0072] ANTI-CAKING AGENTS: calcium silicate, magnesium silicate, silicon dioxide, colloidal silicon dioxide, talc, or mixtures thereof;

[0073] ANTIMICROBIAL AGENTS: benzalkonium chloride, benzethonium chloride, benzoic acid, benzyl alcohol, butyl paraben, cetylpyridinium chloride, cresol, chlorobutanol, dehydroacetic acid, ethylparaben, methylparaben, phenol, phenylethyl alcohol, phenylmercuric acetate, phenylmercuric nitrate, potassium sorbate, propylparaben, sodium benzoate, sodium dehydroacetate, sodium propionate, sorbic acid, thimersol, thymo, or mixtures thereof; and

[0074] COATING AGENTS: sodium carboxymethyl cellulose, cellulose acetate phthalate, ethylcellulose, gelatin, pharmaceutical glaze, hydroxypropyl cellulose, hydroxypropyl methylcellulose, hydroxypropyl methyl cellulose phthalate, methylcellulose, polyethylene glycol, polyvinyl acetate phthalate, shellac, sucrose, titanium dioxide, carnuba wax, microcrystalline wax, or mixtures thereof.

[0075] The dose range for adult humans is generally from 0.005 mg to 10 g/day orally. Tablets or other forms of presentation provided in discrete units may conveniently contain an amount of compound of the invention which is effective at such dosage or as a multiple of the same, for instance, units containing 5 mg to 500 mg, usually around 10 mg to 200 mg. The precise amount of compound administered to a patient will be the responsibility of the attendant physician. However, the dose employed will depend on a number of factors, including the age and sex of the patient, the precise disorder being treated, and its severity.

[0076] Combination therapy can be achieved by administering two or more agents, each of which is formulated and administered separately, or by administering two or more agents in a single formulation. Other combinations are also encompassed by combination therapy. For example, two agents can be formulated together and administered in conjunction with a separate formulation containing a third agent. While the two or more agents in the combination therapy can be administered simultaneously, they need not be. For example, administration of a first agent (or combination of agents) can precede administration of a second agent (or combination of agents) by minutes, hours, days, or weeks. Thus, the two or more agents can be administered within minutes of each other or within 1, 2, 3, 6, 9, 12, 15, 18, or 24 hours of each other or within 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 days of each other or within 2, 3, 4, 5, 6, 7, 8, 9, or 10 weeks of each other. In

some cases even longer intervals are possible. While in many cases it is desirable that the two or more agents used in a combination therapy be present in within the patient's body at the same time, this need not be so. Combination therapy can also include two or more administrations of one or more of the agents used in the combination. For example, if agent X and agent Y are used in a combination, one could administer them sequentially in any combination one or more times, e.g., in the order X-Y-X, X-X-Y, Y-X-Y, Y-Y-X, X-X-Y-Y, etc.

[0077] In Vivo Assay of Hypolipidemic Agents using the Rat Cholesterol Absorption Model. This model is based on models described by Burnett et al (2002), Bioorg. Med. Chem. Lett. 2002 Feb 11;12(3):315-8 and J. Lipid Res. 1999 Oct;40(10):1747-57. Female Sprague-Dawley rats weighing 150-250g are separated into groups of 3 and fasted overnight. The animals (4-6/group) are dosed perorally with 300μL test compounds in olive oil or suitable vehicle. Thirty minutes later, 3-5 microCuries ^{3}H-cholesterol per rat are delivered perorally in 300 μL olive oil . After three hours, 200 μL serum is collected, vortexed with scintillation fluid, and measured for radioactivity in a scintillation counter. Percent inhibition is defined as $100*(1-C_{test}/C_{ctrl})$, where C_{test} and C_{ctrl} refer to ^{3}H levels in serum for the test compound and for the vehicle only control, respectively. Percent inhibition values are reported for a fixed dose. The ED_{50} is the dose at which the half-maximal effect on serum ^{3}H levels is observed for a given test compound.

[0078] In Vivo Assay of Hypolipidemic Agents using the Mouse Cholesterol Absorption Model. Female CD-1 mice weighing 20-30g are separated into groups of 3-8 and fasted overnight. The animals (3-8/group) are dosed perorally with 200μL test compound in olive oil or suitable vehicle. Thirty minutes later, 3-5 microCuries ^{3}H-cholesterol per mouse are delivered perorally in 200 μL olive oil. After three hours, 100 μL serum is collected, vortexed with scintillation fluid, and measured for radioactivity in a scintillation counter. Percent inhibition and ED_{50} are defined as in the Rat Cholesterol Absorption Model above.

[0079] In Vivo Assay of Hypolipidemic Agents Using the Hyperlipidemic Hamster: Hamsters are separated into groups of six and given a controlled cholesterol diet (Purina Chow #5001 containing 0.5% cholesterol) for seven days. Diet consumption is monitored

to determine dietary cholesterol exposure in the face of test compounds. The animals are dosed with the test compound once daily beginning with the initiation of diet. Dosing is by oral gavage of 0.2 mL of corn oil alone (control group) or solution (or suspension) of test compound in corn oil. All animals moribund or in poor physical condition are euthanized. After seven days, the animals are anesthetized by intramuscular (IM) injection of ketamine and sacrificed by decapitation. Blood is collected into vacutainer tubes containing EDTA for plasma lipid analysis and the liver excised for tissue lipid analysis. Lipid analysis is conducted as per published procedures [Schnitzer-Polokoff, R., et al, *Comp. Biochem. Physiol.*, 99A, 4, 665-670 (1991)] and data are reported as percent reduction of lipid versus control.

[0080] In Vivo Assay of Hypolipidemic Agents using the Hamster Acute Cholesterol Absorption Model. Male Syrian Hamsters weighing 120g are separated into groups of 3-6 and fasted overnight. The animals (3-6/group) are dosed perorally with 200μL test compound in olive oil or suitable vehicle. Thirty minutes later, 3-5 microCuries ^{3}H-cholesterol per hamster are delivered perorally in 200 μL olive oil. After three hours, 100-200 μL serum is collected, vortexed with scintillation fluid, and measured for radioactivity in a scintillation counter. Percent inhibition and ED_{50} are defined as in the Rat Cholesterol Absorption Model above.

[0081] The bioabsorption of the compounds herein described may be examined using the Caco-2 cell monolayer model of Hilgers *et al.* [Pharm. Res. 7, 902 (1990)].

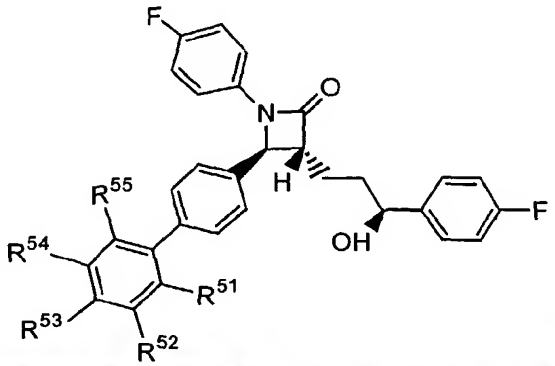
[0082] Pharmacokinetics. To study the pharmacokinetics of compounds, bioavailability studies are carried out in rats. Compounds are prepared in suitable formulations: 5% ethanol in olive oil for oral administration and 2% DMSO: 20% cyclodextrins in H_2O for intravenous administration. Compounds are administered intravenously via tail vein injection and orally by gavage to independent groups of CD rats (200-250g). Serum is collected at various time points and assayed for the presence of compounds using an LC/MS/MS detection method. Samples are diluted 15-fold in 30% acetonitrile in water, then injected (35 μL) into a 3.2 ml/min flow of 5% methanol in water onto a sample extraction cartridge (Waters Oasis HLB Direct Connect), washed for 30 seconds, then loaded onto a reverse phase HPLC column (Thermo Electron Betasil

C18 Pioneer 50 x 2.1 mm, 5 um particle size). Samples are eluted from the reverse phase HPLC column with a gradient: (Mobile Phase A: 5 mM ammonium acetate in dH_2O, Mobile Phase B: 20% methanol in acetonitrile; 40% B ramping to 95% B over 4 minutes, and holding for 3 minutes, then returning to initial conditions to re-equilibrate the column for 1 min, all at a flow rate of 0.3 ml/min.). A Micromass Quattro Micro (Waters Corp.; Milford, MA) triple quadrupole mass spectrometer operated in MRM mode is used for detection. Concentrations are calculated based on standard concentration curves of compounds. MassLynx software (Waters, Corp.; Milford, MA) is used to calculate the absolute concentration of test compound in each serum sample. A concentration versus time plot is generated from the data in Microsoft Excel, Summit Software PK Solutions 2.0 or GraphPad Prism (GraphPad Software, Inc., San Diego, CA) to generate pharmacokinetic curves. An area under the curve (AUC_n, n = length of experiment in minutes or hours) is calculated from the concentration *vs.* time data by the software using the trapezoid method for both the orally and intravenously dosed animals. Oral Bioavailability (F) over the length of the experiment is calculated using the equation:

$$F = (AUC_{oral} * Dose_{i.v.}) / (AUC_{i.v.} * Dose_{oral})$$

[0083] Representative compounds of the invention were tested in the Rat Cholesterol Absorption model above. The compounds of the invention exhibited inhibition as shown below in Tables 1 and 2

Table 1



Example #	R^{51}	R^{52}	R^{53}	R^{54}	R^{55}	% inhibition at 1 mg/kg

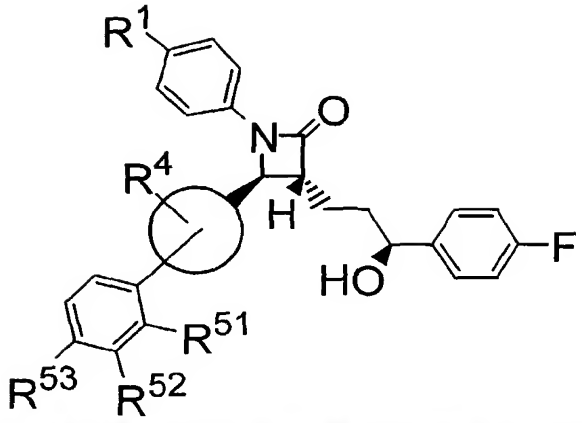
Example #	R^{51}	R^{52}	R^{53}	R^{54}	R^{55}	% inhibition at 1 mg/kg
2			OH			54[1]
3						15[1]
4		OH				72
5			OMe			26[1]
7	OH					30
8			SO_2Me			53
9		OMe	OMe	OMe		40
10		SO_2Me				54[2]
11	OMe	OMe				28
12		OMe				70
13		CHO				70
14		CN				32[3]
15			SO_2NMe_2			8
16		CH_2OH				72
17			NMe_2			43
18			CH_2OH			48
19		OH			Br	66
20		O-glucuronide				59
21		CO_2H				68
22			CO_2H			52
23		NO_2				54[1]
26		NHAc				76[1]
28			NH_2			56
56		$P{=}O(OH)_2$				59
76		O-C6-				56

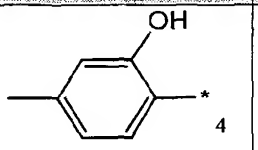
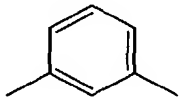
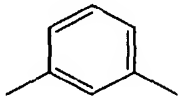
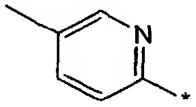
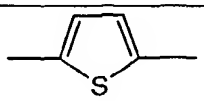
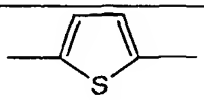
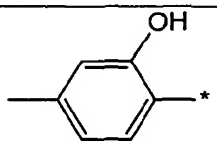
[1] % inhibition at 10 mg/kg
[2] % inhibition at 3 mg/kg
[3] % inhibition at 5 mg/kg

Example #	R^{51}	R^{52}	R^{53}	R^{54}	R^{55}	% inhibition at 1 mg/kg
		glucopyranose				
77		O-C6-methyl glucopyranoside				70
78		O-C6-glucitol				51
81		OMe	OMe			17
82		SMe				28
83		NMe2				38
84			$CH=CH_2$			51
85		OMe			CHO	15
86		NH_2				35
87		$O-CH_2-CH_2-O$				59
88			CH_2CO_2H			30
89			CO_2Me			45
90		Me		Me		27
91		β-naphthyl				56
92		CF_3				17
93		Me				28
94		Me	F			30
95		O-glucopyranose				57
96	OMe	OMe	OMe			69
97	OMe		OMe			40
98	Me					7
99			CHO			38
100		OEt				54
101			OEt			41
102		OMe	OH			56
103		O-nPr				21

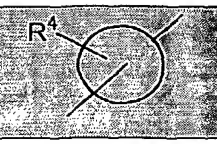
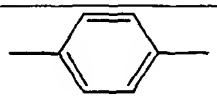
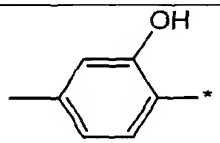
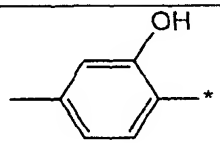
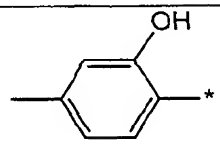
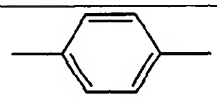
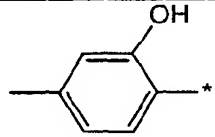
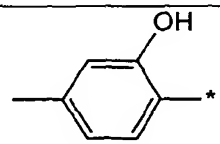
Example #	R^{51}	R^{52}	R^{53}	R^{54}	R^{55}	% inhibition at 1 mg/kg
104		OH			CHO	52
105		O-iPr				15
106		CO_2H	OH			66
107		OMe		OMe		49
108	OH		OH			69
109		O-nBu				52
110		OH	CO_2H			72
111		OMe		F		72
112		OH		F		75
113		C1-glucitol				67
114		OH		OH		72
115		$B(OH)_2$				70
116			C1-gluco pyranose			81
117		C1-CH_2-glucopyranose				26
118		SO_3H				61
119		SH				56
120		NMe_3^+				23

Table 2

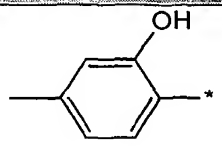
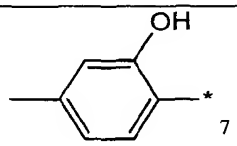
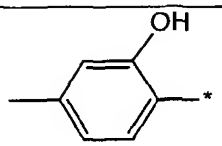
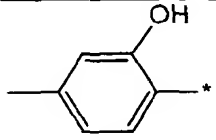
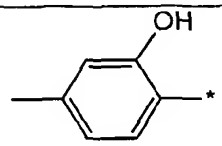


Example #	R^{51}	R^{52}	R^{53}	R^1	R^4	% inhibition at 1 mg/kg
42		OH		H		87
44		OH		F		24
46			OH	F		30
49		OH		H		30
50		OH		H		27
51			OH	H		39
53		SO_3H		H		78

[4] The asterix indicates the point of attachment to the azetidine ring.

Example #	R^{51}	R^{52}	R^{53}	R^{1}		% inhibition at 1 mg/kg
57		OH		H		73
59		$B(OH)_2$		H		70
61		$P{=}O(OH)_2$		H		58[3]
64		C1-glucitol		H		67
65		C1-glucitol		H		60[5]
66			C1-glucitol	H		71[6]
71		C6-S-glucopyranose		H		65
72		C6-R-glucopyranose		H		27[6]
73		C6-S-glucopyranose		H		59
74		C6-R-glucopyranose		H		67

[5] % inhibition at 0.1 mg/kg
[6] % inhibition at 0.3 mg/kg

Example #	R^{51}	R^{52}	R^{53}	R^1	R^4	% inhibition at 1 mg/kg
75		C6-S-glucitol		H		68
121		OH		F		72
122		$P=O(OH)_2$		H		67
123		SO_2Me		H		72
124		OH		Ph		48
125			OH	H		64
127			$P=O(OH)_2$	H		58
128			$SO_3^- Na^+$			60

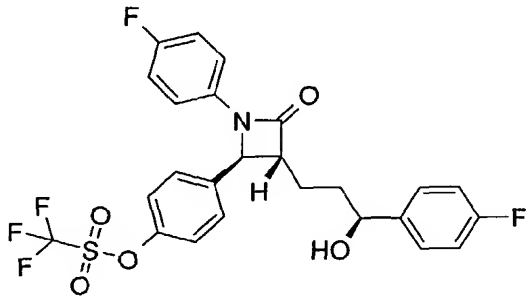
[0084] In general, the compounds of the present invention may be prepared by the methods illustrated in the general reaction schemes as, for example, described below, or by modifications thereof, using readily available starting materials, reagents and conventional synthesis procedures. In these reactions, it is also possible to make use of variants that are in themselves known, but are not mentioned here.

[7] the asterisk indicates the point of attachment to the azetidine ring

[0085] The starting materials, in the case of suitably substituted azetidinones, may be obtained by the methods described in WO 02/50027, WO 97/16424, WO 95/26334, WO 95/08532 and WO 93/02048, the disclosures of which are incorporated herein by reference.

[0086] Processes for obtaining the compounds of the invention are presented below. Although detailed syntheses are not presented for every example in Tables 1 and 2, the procedures below illustrate the methods. The other compounds were made in analogous fashion to those whose synthesis is exemplified.

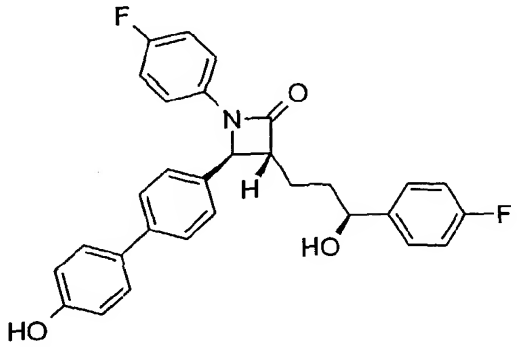
[0087] Example 1. Preparation of the intermediate 4-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}phenyl trifluoromethanesulfonate



(3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4-hydroxyphenyl)azetidin-2-one (150.4 mg, 0.367 mmol) and 4-dimethylaminopyridine (9.4 mg, 0.077 mmol) were dissolved in methylene chloride (10.0 mL). Triethylamine (100 μL, 72.6 mg, 0.717 mmol) was added via syringe followed by *N*-phenyltrifluoromethanesulfonimide (143.6 mg, 0.402 mmol) added as a solid. The reaction was stirred for 3.5 h at room temperature and then poured into water (40 mL) and extracted with 1:1 ethyl acetate-hexane (75 mL). The organic layer was washed with water (40 mL) and brine (40 mL), then dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 10% to 90% ethyl acetate-hexane) to afford 4-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}phenyl trifluoromethanesulfonate (190.8 mg, 96% yield) as a clear film (eventually becomes a while solid); mp 121.6 °C; R_f 0.38 (2:3 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.41 (d, J = 8.7 Hz, 2H), 7.31-7.26 (m, 4H), 7.19 (dd, J = 9.0,

4.6 Hz, 2H), 7.01 (t, J = 8.7 Hz, 2H), 6.95 (t, J = 8.7 Hz, 2H), 4.71 (t, J = 6.0 Hz, 1H), 4.67 (d, J = 2.3 Hz, 1H), 3.10-3.04 (m, 1H), 2.08-1.86 (m, 4H) ppm; MS [M-OH] 524.5

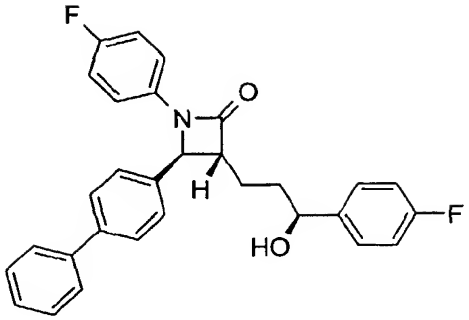
[0088] Example 2. Preparation of (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-hydroxybiphenyl-4yl)azetidin-2-one



4-{(2*S*,3*R*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}phenyl trifluoromethanesulfonate (162.5 mg, 0.30 mmol) and tetrakis(triphenylphosphine)palladium(0) (17.3 mg, 0.015 mmol) were dissolved in toluene (2.5 mL). 2.0 M aqueous potassium carbonate (0.3 mL) and a solution of 4-hydroxyphenylboronic acid (57.9 mg, 0.42 mmol) in ethanol (1.0 mL) were added. The reaction was stirred vigorously for 5 h at refluxing temperature under a nitrogen atmosphere and then diluted with water (2.5 mL), extracted with ethyl acetate (3 x 10 mL), washed with brine (10 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane) to afford (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-hydroxybiphenyl-4-yl)azetidin-2-one (112 mg, 77% yield) as a clear film; mp 110 °C; R_f 0.5 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.5 (d, J = 9.0 Hz, 2H) 7.4 (d, J = 9.0 Hz, 2H) 7.3 (m, 6H), 6.9 (m, 6H), 4.7 (m, 1H), 4.6 (s, 1H), 3.15 (m, 1H), 2.1-1.9 (m, 4H) ppm; MS [M+H] 486.5

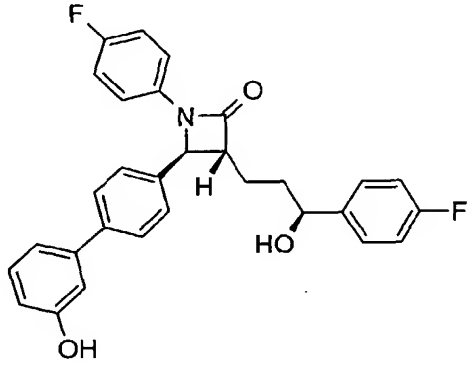
In the same manner was obtained:

[0089] Example 3. (3*R*,4*S*)-4-Biphenyl-4-yl-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one



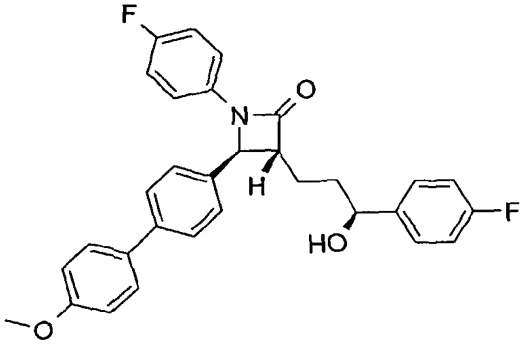
(3*R*,4*S*)-4-Biphenyl-4-yl-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (11.8 mg, 54% yield) as a clear film; purification by chromatography (4 g silica gel, 10% to 100% ethyl acetate-hexane) and then by reverse-phase HPLC (21mm column, 50% to 100% acetonitrile-0.1% trifluoroacetic acid in water); R_f 0.47 (3:2 ethyl acetate-hexane); ^{1}H NMR (300 MHz, CD_3OD) δ 7.63 (d, J = 8.3 Hz, 2H), 7.61-7.58 (m, 2H), 7.45-7.39 (m, 4H), 7.35-7.28 (m, 5H), 7.02 (t, J = 8.8 Hz, 2H), 7.00 (t, J = 8.8 Hz, 2H), 4.63 (t, J = 5.7 Hz, 1H), 3.15-3.00 (m, 1H), 2.05-1.84 (m, 5H) ppm; MS [M-OH] 452.5

[0090] Example 4. (3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)azetidin-2-one



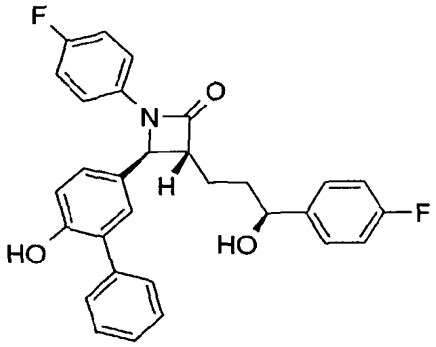
(3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)azetidin-2-one (110 mg, 76% yield using a reaction time of 4 h) as an off white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 107 °C; R_f 0.50 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.6 (d, J = 8.9 Hz, 2H), 7.3 (d, J = 8.9 Hz, 2H), 7.2 (m, 6H), 6.9 (m, 6H), 4.7(m, 1H), 4.6(s, 1H), 3.15 (m, 1H), 2.1-1.9 (m, 4H) ppm; MS [M+H] 486.5

[0091] Example 5. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-methoxybiphenyl-4-yl)azetidin-2-one



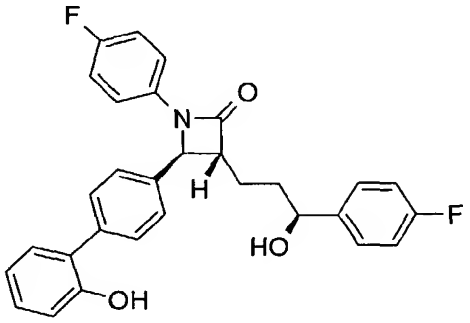
(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-methoxybiphenyl-4-yl)azetidin-2-one (86 mg, 67% yield using a reaction time of 16 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 103 °C; R_f 0.75 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.4 (m, 4H), 7.3 (m, 6H), 6.9 (m, 6H), 4.75 (m, 1H), 4.65 (s, 1H), 3.85 (s, 3H), 3.2 (m, 1H), 2.1-1.9 (m, 4H) ppm; MS [M-OH] 482.5

[0092] Example 6. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(6-hydroxybiphenyl-3-yl)azetidin-2-one



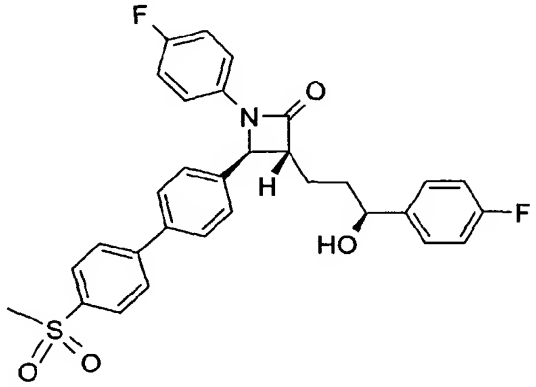
(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(6-hydroxybiphenyl-3-yl)azetidin-2-one (36 mg, 40% yield using a reaction time of 16 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 113 °C; R_f 0.70 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.5-6.9 (m, 16H), 4.75 (m, 1H), 4.65 (s, 1H), 3.2 (m, 1H), 2.1-1.9 (m, 4H) ppm; MS [M+H] 486.5

[0093] Example 7. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(2'-hydroxybiphenyl-4-yl)azetidin-2-one



(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(2'-hydroxybiphenyl-4-yl)azetidin-2-one (74 mg, 51% yield using a reaction time of 2 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 101 °C; R_f 0.50 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.6 (d, J = 9.0 Hz, 2H), 7.4 (d, J = 9.0 Hz, 2H), 7.25 (m, 6H), 6.9 (m, 6H), 6.3 (s, 1H), 4.65 (m, 2H), 3.1 (m, 1H), 2.1-1.9 (m, 4H) ppm; MS [M+H] 486.5

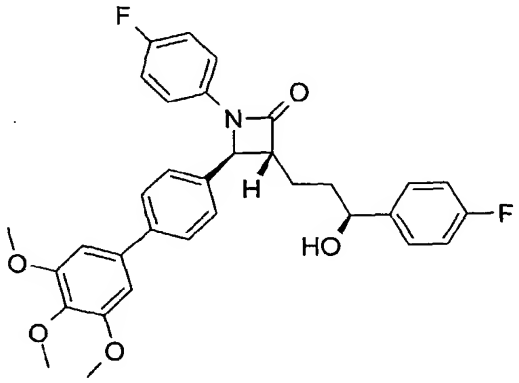
[0094] Example 8. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4'-(methylsulfonyl)biphenyl-4-yl]azetidin-2-one



(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4'-(methylsulfonyl)biphenyl-4-yl]azetidin-2-one (80 mg, 79% yield using a reaction time of 4 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 111°C; R_f 0.40 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.1 (d, J = 9.3 Hz, 2H), 7.8 (d, J = 9.3 Hz, 2H), 7.6 (d, J = 8.1 Hz, 2H), 7.5 (d, J = 8.1 Hz, 2H), 7.3 (m, 5H), 6.9 (m, 3H), 6.3 (s, 1H), 4.7 (m, 1H), 4.6 (s, 1H), 3.1 (s, 4H),

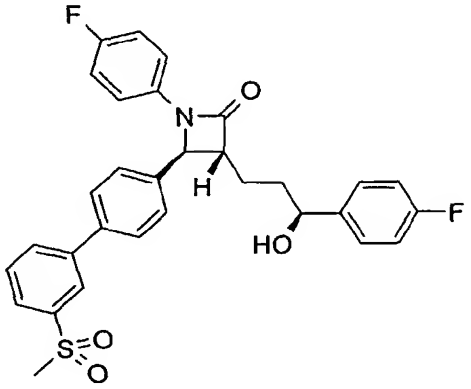
2.1-1.9 (m, 4H) ppm; MS [M-OH] 530.6

[0095] Example 9. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3',4',5'-trimethoxybiphenyl-4-yl)azetidin-2-one



(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3',4',5'-trimethoxybiphenyl-4-yl)azetidin-2-one (93 mg, 90% yield using a reaction time of 2 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 103 °C; R_f 0.4 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.6 (d, J = 9.0 Hz, 2H), 7.5 (d, J = 9.0 Hz, 2H), 7.3 (m, 4H), 7.0 (m, 4H), 6.8 (s, 2H), 4.7 (m, 1H), 4.6 (s, 1H), 3.9 (s, 9H), 3.1 (s, 1H), 2.1-1.9 (m, 4H) ppm; MS [M-OH] 542.6

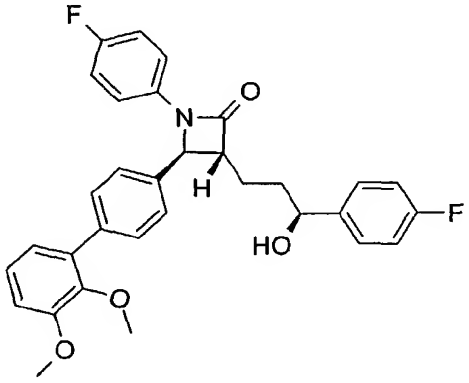
[0096] Example 10. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3'-(methylsulfonyl)biphenyl-4-yl]azetidin-2-one



(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3'-(methylsulfonyl)biphenyl-4-yl]azetidin-2-one (92 mg, 90% yield using a reaction time of 2 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 104 °C; R_f 0.45 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz,

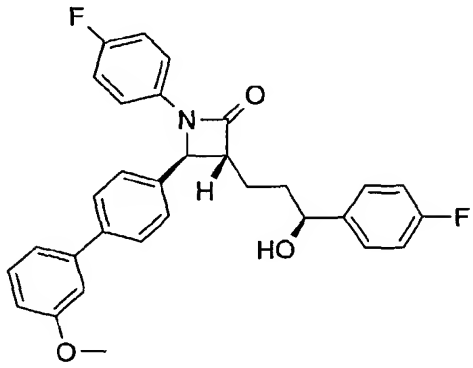
$CDCl_3$) δ 8.2-6.8 (m, 15H), 4.7 (m, 1H), 4.65 (s, 1H), 3.2 (m, 1H), 3.1 (s, 3H), 2.1-1.9 (m, 4H) ppm; MS [M-OH] 530.6

[0097] Example 11. (3*R*,4*S*)-4-(2',3'-dimethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one



(3*R*,4*S*)-4-(2',3'-dimethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (132.0 mg, 90% yield using a reaction time of 2 h) as a white solid; purification by chromatography (12 g silica gel, 10% to 100% ethyl acetate-hexane); mp 101 °C; R_f 0.70 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.6 (d, J = 8.5 Hz, 2H), 7.4 (d, J = 8.5 Hz, 2H), 7.3 (m, 5H), 7.0 (m, 6H), 4.7 (m, 1H), 4.6 (s, 1H), 3.9 (s, 3H), 3.7 (s, 3H), 3.3 (m, 1H), 2.1-1.9 (m, 4H) ppm; MS [M-OH] 512.6

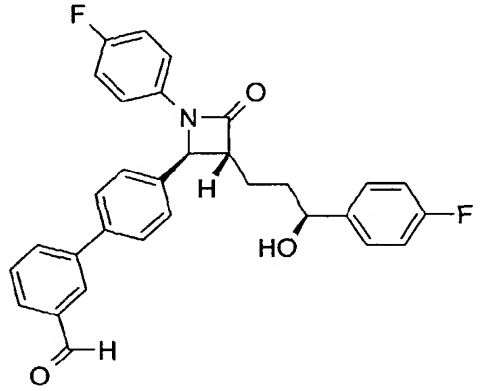
[0098] Example 12. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-methoxybiphenyl-4-yl)azetidin-2-one



(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-methoxybiphenyl-4-yl)azetidin-2-one (36.1 mg, 77% yield) as a clear foam; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.52 (40% ethyl

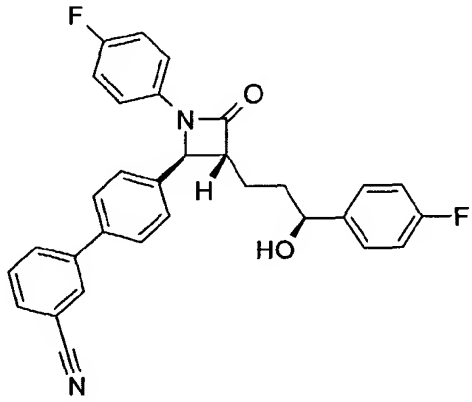
acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.58 (d, J = 8.7 Hz, 2H), 7.30 (m, 7H), 7.15 (dt, J = 13.5, 1.5 Hz, 1H), 7.09 (t, J = 2.4 Hz, 1H), 7.00 (t, J = 10.4 Hz, 2H), 6.92 (m, 3H), 4.73 (t, J = 6.2 Hz, 1H), 4.67 (d, J = 2.1 Hz, 1H), 3.86 (s, 3H), 1.95 (m, 4H); MS [M-OH] 482.5

[0099] Example 13. 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-carbaldehyde



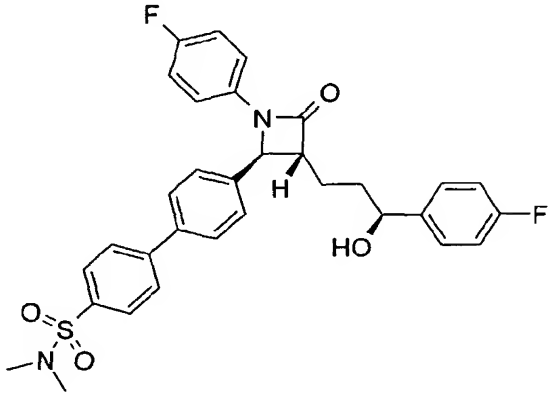
4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-carbaldehyde (32.7 mg, 67% yield) as a clear foam; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.72 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 10.09 (s, 1H), 8.09 (d, J = 1.8 Hz, 1H), 7.85 (m, 2H), 7.62 (m, 3H), 7.44 (d, J = 7.8 Hz, 2H), 7.27 (m, 4H), 7.03 (t, J = 8.6 Hz, 2H), 6.95 (t, J = 8.8 Hz, 2H), 4.74 (m, 1H), 4.70 (d, J = 2.4 Hz, 1H), 3.14 (m, 1H), 1.97 (m, 4H) ppm; MS [M-OH] 480.5

[00100] Example 14. 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-carbonitrile



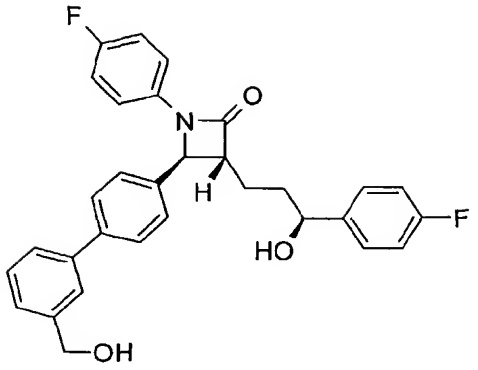
4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-carbonitrile (32.5 mg, 57% yield) as a clear foam; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.69 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.84 (m, 1H), 7.79 (m, 1H), 7.64 (m, 1H), 7.55 (m, 3H), 7.44 (d, J = 6.6 Hz, 2H), 7.28 (m, 4H), 7.02 (t, J = 8.9 Hz, 2H), 6.95 (t, J = 8.9 Hz, 2H), 4.75 (t, J = 6.2 Hz, 1H), 4.68 (d, J = 2.1 Hz, 1H), 3.13 (m, 1H), 2.01 (m, 4H) ppm; MS [M-OH] 477.5

[00101] Example 15. 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-*N*,*N*-dimethylbiphenyl-4-sulfonamide



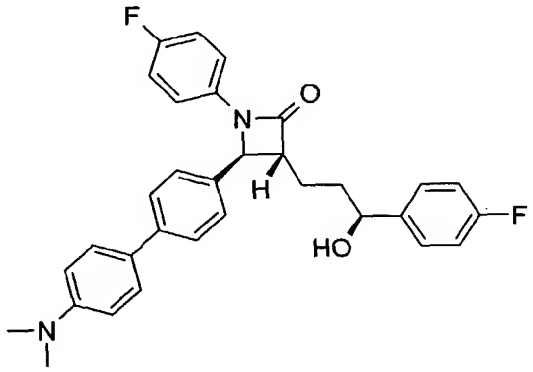
4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-*N*,*N*-dimethylbiphenyl-4-sulfonamide (39.6 mg, 73% yield) as a faint yellow foam; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.50 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.83 (d, J = 5.4 Hz, 2H), 7.72 (d, J = 8.1 Hz, 2H), 7.61 (d, J = 8.1 Hz, 2H), 7.44 (d, J = 8.4 Hz, 2H), 7.25 (m, 4H), 7.02 (t, J = 8.4, 9.0 Hz, 2H), 6.95 (t, J = 8.7 Hz, 2H), 4.74 (t, J = 5.5 Hz, 1H), 4.69 (d, J = 1.8 Hz, 1H), 3.13 (m, 1H), 2.75 (s, 6H), 2.01 (m, 4H) ppm; MS [M-OH] 559.7

[00102] Example 16. (3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-(hydroxymethyl)biphenyl-4-yl)azetidin-2-one



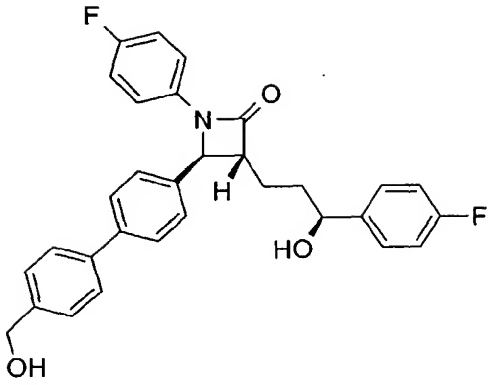
(3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-(hydroxymethyl)biphenyl-4-yl)azetidin-2-one (37.3 mg, 80% yield) as a clear foam; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.43 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.59 (m, 3H), 7.49 (m, 2H), 7.37 (m, 3H), 7.27 (m, 4H), 7.02 (t, J = 8.7 Hz, 2H), 6.95 (t, J = 8.7 Hz, 2H), 4.74 (m, 1H), 4.67 (d, J = 2.4 Hz, 1H), 3.14 (m, 1H), 1.99 (m, 4H) ppm; MS [M-OH] 482.5

[00103] Example 17. (3*R*,4*S*)-4-[4'(dimethylamino)biphenyl-4-yl]-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one



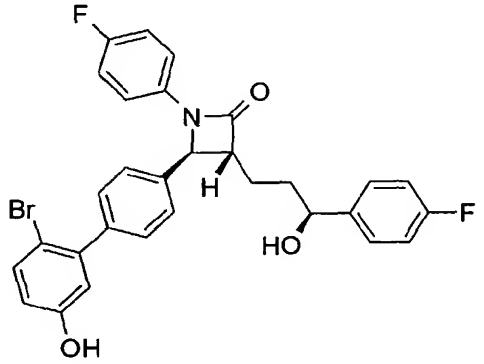
(3*R*,4*S*)-4-[4'(dimethylamino)biphenyl-4-yl]-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (35.4 mg, 79% yield) as a white foam; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.78 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.53 (m, 4H), 7.31 (m, 8H), 7.02 (t, J = 8.7 Hz, 2H), 6.94 (t, J = 8.7 Hz, 2H), 4.73 (m, 1H), 4.64 (d, J = 2.1 Hz, 1H), 3.14 (m, 1H), 3.10 (s, 6H) 1.97 (m, 4H) ppm; MS [M+H] 513.6

[00104] Example 18. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4-(hydroxymethyl)phenyl]azetidin-2-one



(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4-(hydroxymethyl)phenyl]azetidin-2-one (37.2 mg, 75% yield with a 7% impurity) as a clear film; purification by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane); R_f 0.43 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.57 (m, 4H), 7.44 (d, J = 8.4, 2H), 7.38 (d, J = 8.4, 2H), 7.27 (m, 4H), 7.02 (t, J = 8.9 Hz, 2H), 6.95 (t, J = 8.7 Hz, 2H), 4.73 (m, 3H), 4.66 (d, J = 2.4 Hz, 1H), 3.12 (m, 1H), 1.97 (m, 4H) ppm; MS [M-OH] 482.5

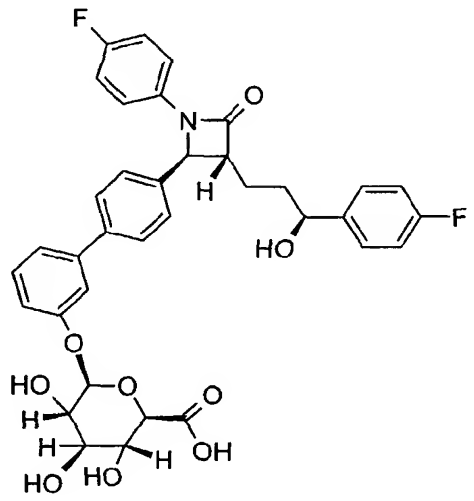
[00105] Example 19. Preparation of (3*R*,4*S*)-4-(2'-bromo-5'-hydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one



(3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)azetidin-2-one (19.2 mg, 0.04 mmol) was dissolved in chloroform (0.4 mL) and tetrabutylammonium tribromide (18.8 mg, 0.04 mmol) was added at room temperature. After 10 minutes, saturated aqueous sodium thiosulfate (2 mL) was added to quench the reaction. The mixture was poured into a seperatory funnel, extracted with dichloromethane (4 x 10 mL), dried over sodium sulfate, filtered and concentrated.

(3*R*,4*S*)-4-(2'-bromo-5'-hydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one was purified by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane) and then by reverse-phase HPLC (21mm column, 50% to 100% acetonitrile-0.1% trifluoroacetic acid in water) to afford (3*R*,4*S*)-4-(2'-bromo-5'-hydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (8.0 mg, 34% yield) as a clear foam; R_f 0.51 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.49 (d, J = 8.7 Hz, 1H), 7.40 (m, 4H), 7.29 (m, 4H), 7.02 (t, J = 8.7 Hz, 2H), 6.95 (t, J = 8.7 Hz, 2H), 6.80 (d, J = 3.3, 1H), 6.73 (dd, J = 3.0, 3.0 Hz, 1H), 4.74 (t, J = 6.2 Hz, 2H), 4.67 (d, J = 2.1 Hz, 1H), 3.14 (m, 1H) 1.99 (m, 4H) ppm; MS [M-OH] 547.4

[00106] Example 20. Preparation of 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl β-L-glucopyranosiduronic acid



[00107] Step 1: Preparation of (1*S*)-1-(4-fluorophenyl)-3-[(3*R*,4*S*)-1-(4-fluorophenyl)-2-oxo-4-(4-{[(trifluoromethyl)sulfonyl]oxy}-phenyl)azetidin-3-yl]propyl acetate

[00108] 4-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}phenyl trifluoromethanesulfonate (0.16 g, 0.35 mmol) was dissolved in dichloromethane (2 mL). To this was added acetic anhydride (0.04 mL, 0.45 mmol), triethylamine (0.08 mL, 0.60 mmol) and 4-dimethylaminopyridine (18.3 mg, 0.15 mmol). The reaction was stirred at room temperature for 18 h after which time it was diluted with

water (5 mL) and extracted with dichloromethane (10 mL). The aqueous layer was re-extracted with dichloromethane (3 x 10 mL) and the organic fractions were combined, dried over sodium sulfate, filtered and concentrated. The residue was purified by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane) to afford (1*S*)-1-(4-fluorophenyl)-3-[(3*R*,4*S*)-1-(4-fluorophenyl)-2-oxo-4-(4-[(trifluoromethyl)sulfonyl]oxy}-phenyl)azetidin-3-yl]propyl acetate (0.20 g, 0.35 mmol, 100%) as a clear film.

[00109] Step 2: Preparation of (1*S*)-1-(4-fluorophenyl)-3-[(2*S*,3*R*)-1-(4-fluorophenyl)-2-(3'-hydroxybiphenyl-4-yl)-4-oxoazetidin-3-yl]propyl acetate.

[00110] The product of step 1 (0.20 g, 0.35 mmol) and tetrakis(triphenylphosphine)palladium(0) (20.3 mg, 0.018 mmol) were dissolved in toluene (10 mL). 2.0 M aqueous potassium carbonate (0.35 mL) and a solution of 4-hydroxyphenylboronic acid (67.8 mg, 0.49 mmol) in ethanol (2.5 mL) was added. The reaction was stirred vigorously for 4 h at refluxing temperature under a nitrogen atmosphere and then diluted with water (2.5 mL), extracted with ethyl acetate (3 x 10 mL), washed with brine (10 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane) to afford (1*S*)-1-(4-fluorophenyl)-3-[(2*S*,3*R*)-1-(4-fluorophenyl)-2-(3'-hydroxybiphenyl-4-yl)-4-oxoazetidin-3-yl]propyl acetate (157 mg, 85% yield) as a clear film.

[00111] Step 3: Preparation of (1*S*)-1-(4-fluorophenyl)-3-((3*R*,4*S*)-1-(4-fluorophenyl)-2-oxo-4-{3'-[(2,3,4-tri-*O*-acetyl-6-hydroperoxy-β-L-*gluco*-hexodialdo-1,5-pyranosyl)oxy]biphenyl-4-yl}azetidin-3-yl)propyl acetate.

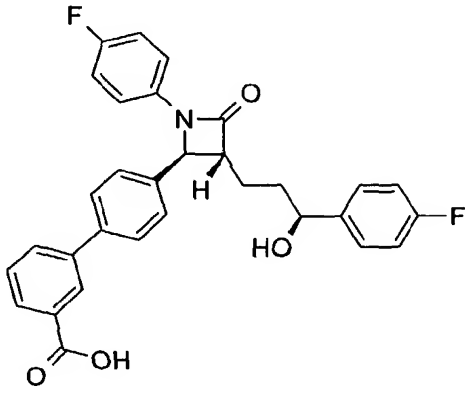
[00112] The product of step 2 (69.4 mg, 0.132 mmol) and methyl 2,3,4-tri-*O*-acetyl-1-*O*-(2,2,2-trifluoroethanimidoyl)-D-glucopyranuronate (49.0 mg, 0.110 mmol) were azeotroped with toluene (3 x 15 mL) and dried *in vacuo* for 18 h. The dried syrup was suspended in dichloromethane (1.1 mL) and the reaction was cooled to –25 °C. Freshly distilled (over calcium hydride) boron trifluoride diethyl etherate was added and the reaction was maintained at -25° C for 2 h and warmed to 10 °C over about 3.5 h. The mixture was diluted with saturated aqueous ammonium chloride (2 mL), extracted with ethyl acetate (3 x 10 mL), washed with brine (10 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 5% to 95% ethyl acetate-

hexane) to afford (1*S*)-1-(4-fluorophenyl)-3-((3*R*,4*S*)-1-(4-fluorophenyl)-2-oxo-4-{3'-[(2,3,4-tri-*O*-acetyl-6-hydroperoxy-β-L-*gluco*-hexodialdo-1,5-pyranosyl)oxy]biphenyl-4-yl}azetidin-3-yl)propyl acetate (57.2 mg, 87% based on recovered starting material) as a white foam.

[00113] Step 4: Preparation of 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl β-L-glucopyranosiduronic acid.

[00114] The product of step 3 (57.2 mg, 0.068 mmol) was dissolved in 1:1 methanol-triethylamine (2.8 mL). To this solution was added water (4.25 mL). The reaction progress was monitored by TLC (5% acetic acid and 15% methanol in dichloromethane) and was complete after 19 hours. The methanol and triethylamine were evaporated *in vacuo*, the residue was acidified with 1 N aqueous hydrochloric acid (1.4 mL), extracted with ethyl acetate (20 mL), washed with brine (5 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (10 g silica gel, 5% acetic acid and 15% methanol in dichloromethane) to afford 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl β-L-glucopyranosiduronic acid (32.6 mg, 73%) as an off-white foam; R_f 0.37 (5% acetic acid and 15% methanol in dichloromethane); ^{1}H NMR (300 MHz, CD_3OD) δ 7.63 (d, J = 7.8 Hz, 2H), 7.43 (d, J = 8.1 Hz, 2H), 7.33 (m, 7H), 7.06 (m, 5H), 5.03 (m, 1H), 4.63 (t, J = 5.1, 5.1 Hz, 2H), 3.94 (m, 3H), 3.13 (m, 1H) 1.91 (m, 4H) ppm; MS [M-H] 660.6

[00115] Example 21. Preparation of 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl]biphenyl-3-carboxylic acid

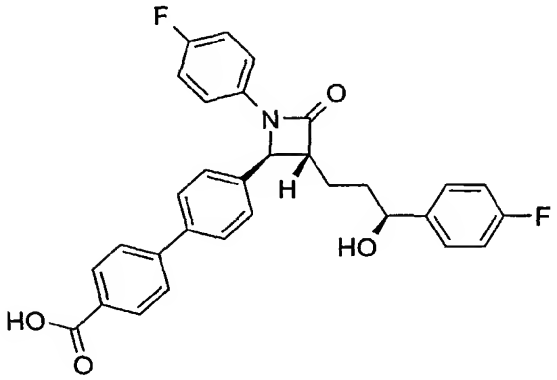


4-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-

oxoazetidin-2-yl}phenyl trifluoromethanesulfonate (51.1 mg, 0.094 mmol) and 3-carboxyphenylboronic acid (21.9 mg, 0.132 mmol) were dissolved in 1:1 toluene:ethanol (2 mL). 2.0 M aqueous potassium carbonate (0.14 mL) was added and the solution degassed. Tetrakis(triphenylphosphine)palladium(0) (5.1 mg, 0.005 mmol) was added and the reaction stirred vigorously for 2 h at refluxing temperature under a nitrogen atmosphere. The cooled reaction was diluted into dichloromethane (15 mL), water (3 mL) was added and the pH was adjusted to 3 with 5% aqueous sodium bisulfate. The layers were separated and the aqueous layer extracted with dichloromethane (2 x 5 mL). The combined organic extracts were dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 5% methanol in dichloromethane) to afford 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl]biphenyl-3-carboxylic acid (41.9 mg, 86% yield) as a colorless foam; R_f 0.15 (5% methanol in dichloromethane); ^{1}H NMR (300 MHz, $CDCl_3$) δ?8.31 (m, 1H), 8.09 (dt, J = 7.8, 1.5 Hz, 1H), 7.79-7.39 (m, 6H), 7.23-7.32 (m, 4H), 6.90-7.02 (m, 4H), 4.75 (t, J = 5.7 Hz, 1H), 4.69 (d, J = 2.1 Hz), 3.12 (m, 1H), 2.10-1.90 (m, 4H) ppm; MS [M-H] 512.5

In the same manner was obtained:

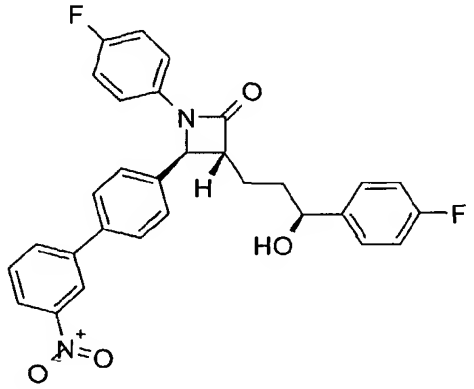
[00116] Example 22. 4'-{(2*S*,3*R*)-1-(4-fluorophenyl)3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl]biphenyl-4-carboxylic acid



4'-{(2*S*,3*R*)-1-(4-fluorophenyl)3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl]biphenyl-4-carboxylic acid (21.0 mg, 67% yield) as a white foam; purification by chromatography (12 g silica gel, 5% methanol in dichloromethane); R_f 0.14 (5% methanol in dichloromethane); ^{1}H NMR (300 MHz, $CDCl_3$) δ ?8.17 (d, J = 8.4

Hz, 2H), 7.65 (t, J = 8.1 Hz, 4H), 7.43 (d, J = 8.4 Hz, 2H), 7.33-7.24 (m, 4H), 7.04-6.92 (m, 4H), 4.77 (t, J = 5.7 Hz, 1H), 4.70 (d, J = 2.1 Hz, 1H), 3.15 (m, 1H), 1.92-2.09 (m, 4H) ppm; MS [M-H] 512.5

[00117] Example 23. Preparation of (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-nitrobiphenyl-4-yl)azetidin-2-one

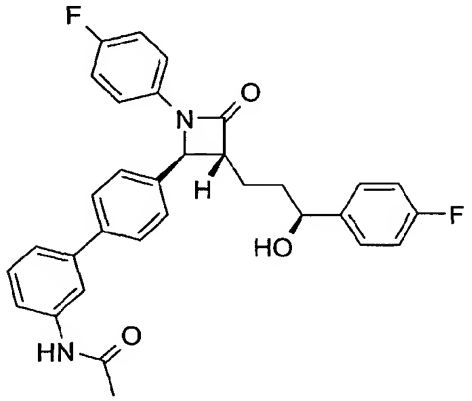


4-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}phenyl trifluoromethanesulfonate (50.0 mg, 0.092 mmol) and 3-nitrophenylboronic acid (21.6 mg, 0.129 mmol) were dissolved in 1:1 toluene:ethanol (2 mL). 2.0 M aqueous potassium carbonate (0.092 mL) was added and the solution degassed. Tetrakis(triphenylphosphine)palladium(0) (5.7 mg, 0.005 mmol) was added and the reaction stirred vigorously for 2 h at refluxing temperature under a nitrogen atmosphere. The cooled reaction was diluted into dichloromethane (15 mL). The layers were separated and the aqueous layer further extracted with dichloromethane (2 x 5 mL). The combined extracts were dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 5% to 50% ethyl acetate-hexane) to afford (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-nitrobiphenyl-4-yl)azetidin-2-one (45.0 mg, 95% yield) as a clear film; R_f 0.33 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ ?8.42 (m, 1H), 8.21 (ddd, J = 8.1, 2.4, 1.2 Hz, 1H), 7.89 (ddd, J = 7.9, 1.5, 1.2 Hz, 1H), 7.63 (d, J = 8.1 Hz, 2H), 7.45 (d, J = 8.1 Hz, 2H), 7.33-7.22 (m, 4H), 7.04-6.92 (m, 4H), 4.76 (t, J = 6.0 Hz, 1H), 4.71 (d, J = 2.1 Hz, 1H), 3.14 (m, 1H), 1.91-2.11 (m, 4H) ppm; MS [M-OH] 497.5

In the same manner was obtained:

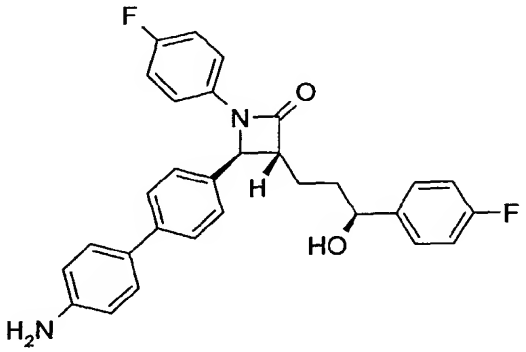
[00118] Example 26. *N*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-

hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)acetamide



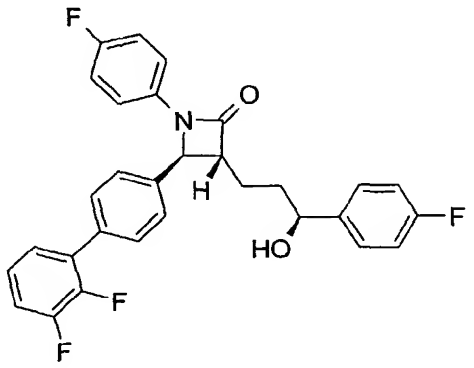
N-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)acetamide (18.8 mg, 44% yield) as a white foam; purification by chromatography (12 g silica gel, 50% ethyl acetate-hexane); R_f 0.07 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.81 (b, 1H), 7.72-7.19 (m, 12H), 6.99 (t, J = 8.7 Hz, 2H), 6.93 (t, J = 9.0 Hz, 2H), 4.72 (t, J = 5.7 Hz, 1H), 4.65 (d, J = 2.1 Hz, 1H), 3.13 (m, 1H), 2.17 (s, 3H), 2.04-1.88 (m, 4H) ppm; MS [M-OH] 509.6

[00119] Example 28. (3*R*,4*S*)-4-(4'-aminobiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl] azetidin-2-one



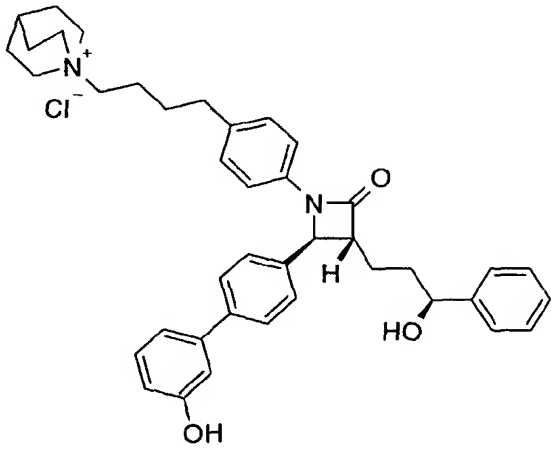
(3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-aminobiphenyl-4-yl)azetidin-2-one (42.0 mg, 95% yield) as a brown film; purification by chromatography (12 g silica gel, 50% ethyl acetate-hexane); R_f 0.32 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.52 (d, J = 8.1 Hz, 2H), 7.39-7.23 (m, 8H), 7.00 (t, J = 8.7 Hz, 2H), 6.92 (t, J = 8.7 Hz, 2H), 6.74 (d, J = 8.4 Hz, 2H), 4.72 (t, J = 5.7 Hz, 1H), 4.63 (d, J = 2.4 Hz, 1H), 3.14 (m, 1H), 2.11-1.91 (m, 4H) ppm; MS [M+H] 485.5

[00120] Example 29. (3*R*,4*S*)-1-(2',3'-difluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3',4'-difluorobiphenyl-4-yl)azetidin-2-one



(3*R*,4*S*)-1-(2',3'-difluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3',4'-difluorobiphenyl-4-yl)azetidin-2-one (36.9 mg, 86% yield) as a clear film; purification by chromatography (12 g silica gel, 5% to 50% ethyl acetate-hexane); R_f 0.51 (50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.55 (dd, J = 8.3, 1.5 Hz, 2H), 7.41 (d, J = 6.9 Hz, 2H), 7.32-7.22 (m, 4H), 7.19-7.12 (m, 3H), 7.01 (t, J = 8.7 Hz, 2H), 6.95 (t, J = 9.0 Hz, 2H), 4.74 (t, J = 6.0 Hz, 1H), 4.68 (d, J = 2.7 Hz, 1H), 3.14 (m, 1H), 2.07-1.90 (m, 4H) ppm; MS [M-OH] 488.5

[00121] Example 31. 1-[4-(4-{(2*S*,3*R*)-2-(3'-hydroxybiphenyl-4-yl)-3-[(3*S*)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-1-yl}phenyl)butyl]-1-azoniabicyclo[2.2.2]octane chloride.



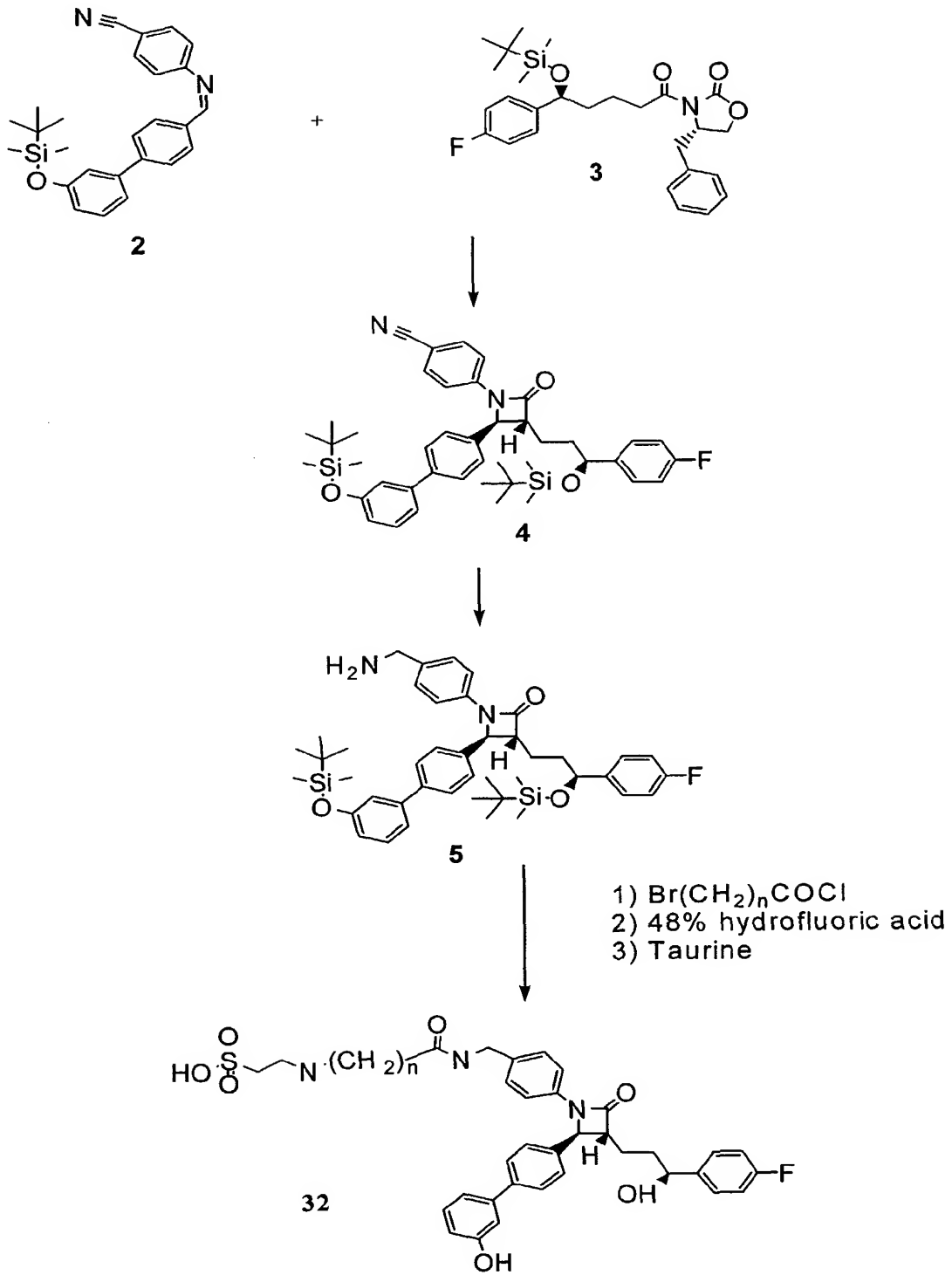
[00122] A quaternary salt is made in the following manner. (3-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)boronic acid and 4-bromostyrene are coupled under

Suzuki conditions with tetrakis(triphenylphosphine)palladium(0) and 2.0 M aqueous potassium carbonate in toluene-ethanol solvent. The product is reacted with chlorosulfonyl isocyanate in ethereal solvent followed by alkali aqueous work-up to generate a β-lactam. The amide proton is exchanged for an aryl group by reaction with 4-iodophenylcarbonylallyl (generated from the commercially available acid by borane reduction and protected with allyl chloroformate) using *trans*-1,2-cyclohexanediamine and copper (I) iodide in decane-dioxane as solvent. Deprotonation of the 3-position of the β-lactam with a suitable base, such as lithium diisopropylamide, and subsequent quenching with *tert*-butyl{[(1*S*)-4-iodo-1-phenylbutyl]oxy}dimethylsilane (generated from the commercially available (*S*)-(-)-3-chloro-1-phenyl-1-propanol by protection with *tert*-butyldimethylchlorosilane and Finkelstein reaction with sodium iodide) provide the 3-substituted intermediate. The allyloxycarbonate protecting group is removed with ammonium formate and tetrakis(triphenylphosphine)palladium(0) in tetrahydrofuran and the resulting alcohol converted into the bromide using carbon tetrabromide and triphenylphosphine in dichloromethane. The silyl protecting groups are removed from the benzyl alcohol and the phenol using 48% hydrofluoric acid in acetonitrile. The resulting compound is reacted with a tertiary amine, such as quinuclidine, purified by HPLC and passed through a chloride ion-exchange column to afford 1-[4-(4-{(2*S*,3*R*)-2-(3'-hydroxybiphenyl-4-yl)-3-[(3*S*)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-1-yl}phenyl)butyl]-1-azoniabicyclo[2.2.2]octane chloride.

[00123] Example 32. Illustrated in Scheme I below is the general method for the preparation of cholesterol absorption inhibitors of general formula 32. Imines 2 are made by refluxing 4-cyanoaniline with the appropriate aldehyde in isopropanol. Condensation of imine 2 with the benzyloxazolidinone compound 3 using titanium tetrachloride, and subsequent cyclization using N,O-bistrimethylacetamide and catalytic tetra-n-butylammonium fluoride, affords the azetidinone 4. Reduction of the cyano group in 4 to the amine 5 is accomplished under hydrogen atmosphere over excess Raney-Nickel in ethanol and ammonium hydroxide. Acylation with the appropriate acid chloride [$Br(CH2)_nCOCl$], followed by reaction with hydrofluoric acid in acetonitrile to remove the silyl protecting groups, and subsequent reaction with taurine provides the finally

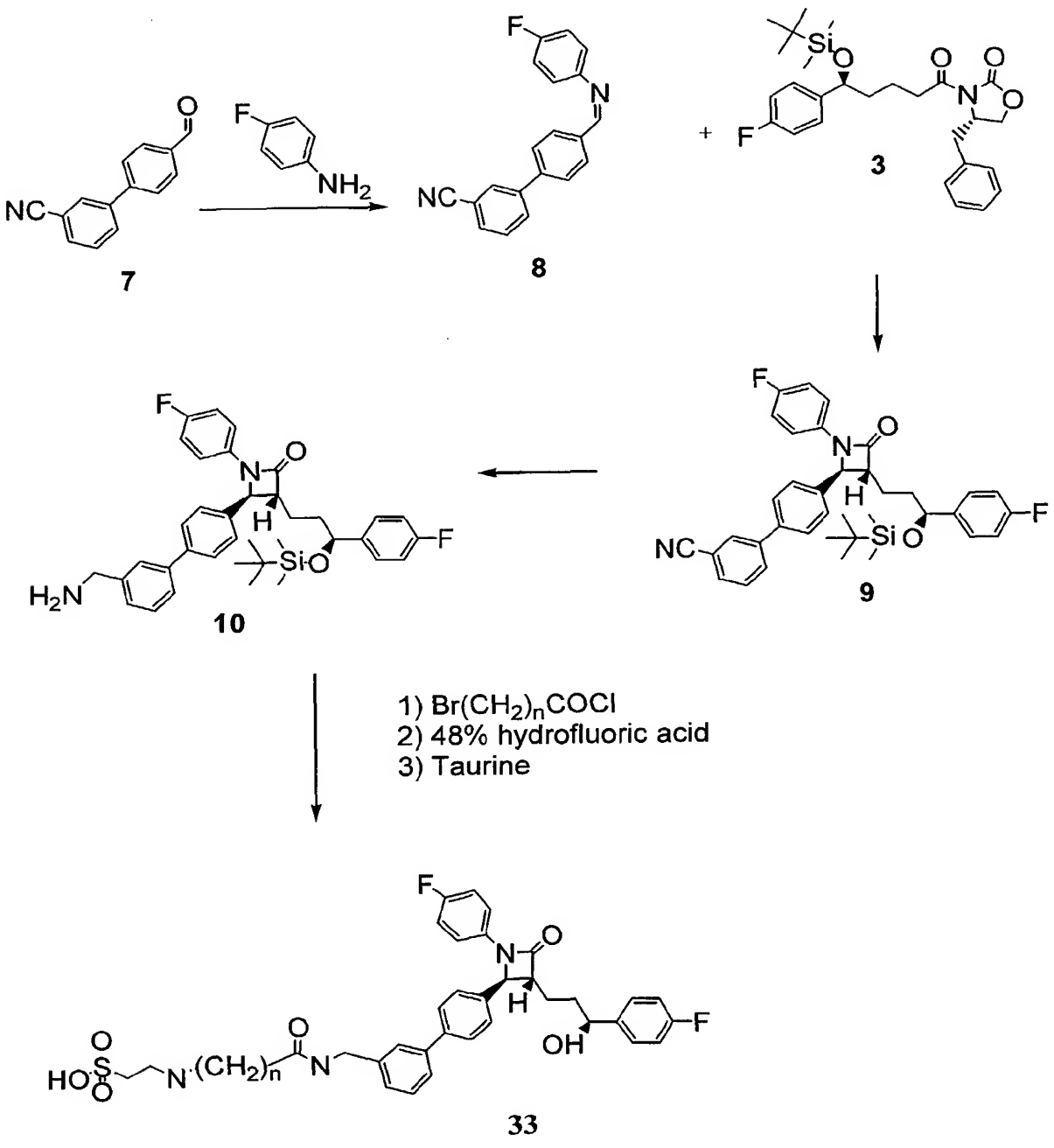
product 32. It is noted that in this scheme the taurine is for illustration and that a large variety of functional groups can be substituted in its place.

Scheme I



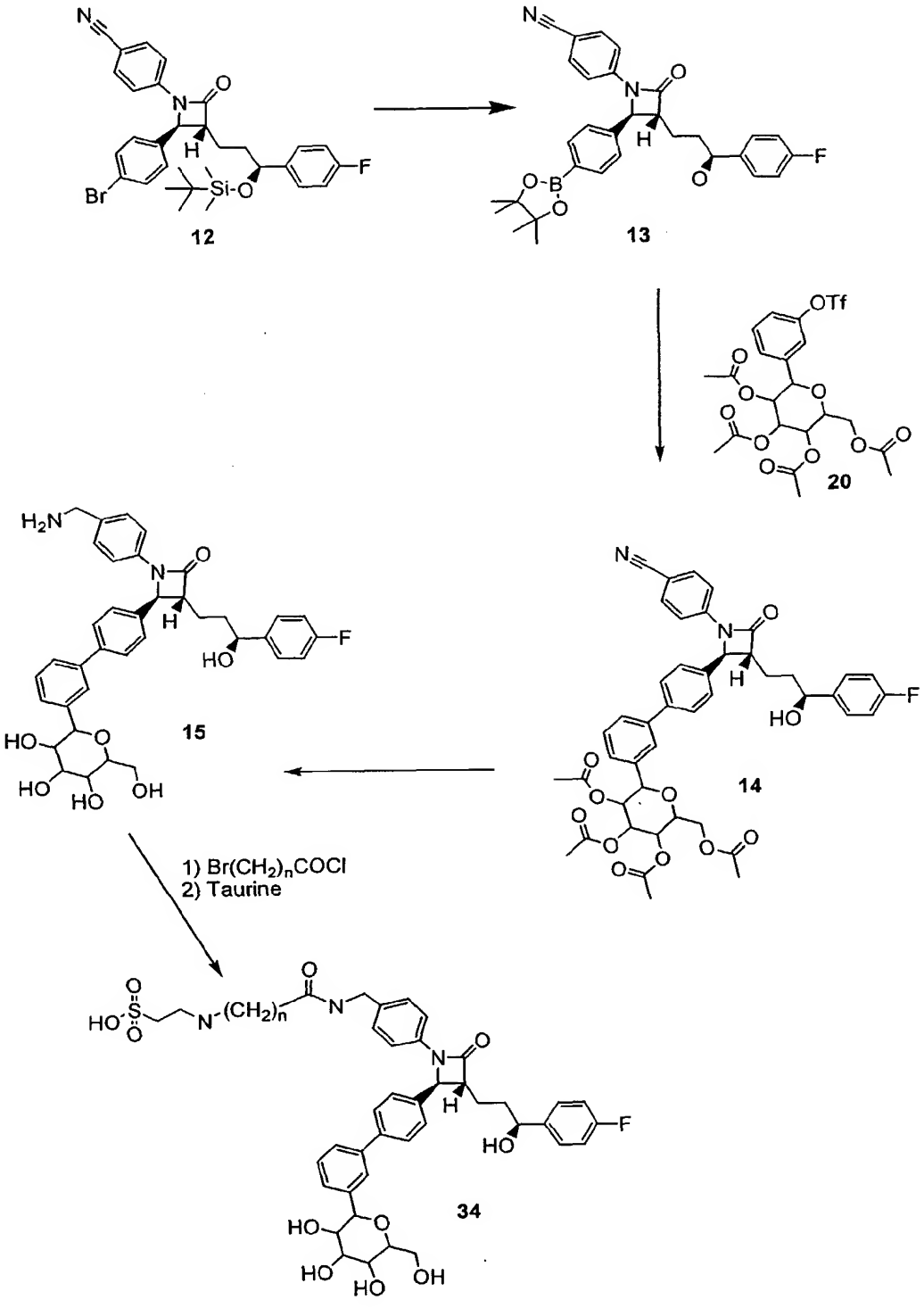
[00124] Example 33. Illustrated in Scheme II below is the general method for the preparation of cholesterol absorption inhibitors of general formula 33. The aldehyde 7 is made by Suzuki coupling of 4-bromobenzaldehyde with 3-cyanophenylboronic acid. Refluxing 4-fluoroaniline with the aldehyde 7 in isopropanol makes the imine 8. Condensation of imine 8 with benzyloxazolidinone compound 3 using titanium tetrachloride and subsequent cyclization, using N,O-bistrimethylacetamide and catalytic tetra-n-butylammonium fluoride, affords the azetidinone 9. Reduction of the cyano group in 9 to the amine 10 is accomplished under hydrogen atmosphere over excess Raney-Nickel in ethanol and ammonium hydroxide. Acylation with the appropriate acid chloride [$Br(CH2)_nCOCl$], followed by reaction with hydrofluoric acid in acetonitrile to remove the silyl protecting groups, and reaction with taurine provides the final product 11. It is noted that in this scheme the taurine is for illustration and that a large variety of functional groups can be substituted in its place.

Scheme II

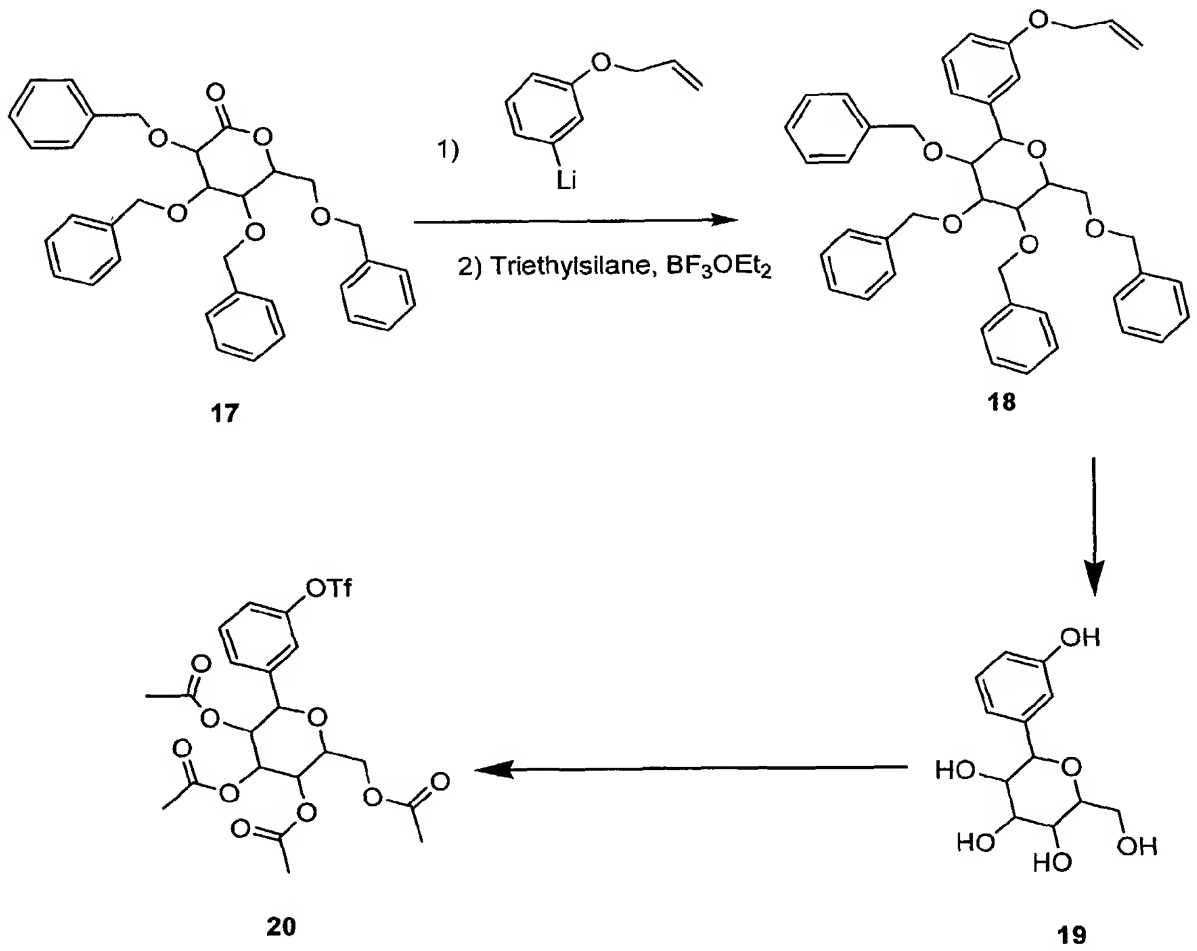

F
NC
O
NH2
N
7
8
Si
O
N
3
9
10
H2N
1) Br(CH2)nCOCl
2) 48% hydrofluoric acid
3) Taurine
HO
S
(CH2)n
OH
33

[00125] Example 34. Illustrated in Scheme III below is the general method for the preparation of cholesterol absorption inhibitors of general formula 34. An imine is made by condensing 4-bromobenzaldehyde with 4-cyanoaniline, followed by condensation with the benzyloxazolidinone compound 3 using titanium tetrachloride, and subsequent cyclization, using N,O-bistrimethylacetamide and catalytic tetra-n-butylammonium fluoride, to afford the azetidinone 12. Hydrofluoric acid in acetonitrile is used to remove the silyl protecting group, and coupling to bis(pinacolato)diboron using catalytic palladium affords compound 13. Suzuki coupling with intermediate 20 affords compound 14. Reduction of the cyano group is accomplished under hydrogen atmosphere over excess Raney-Nickel in ethanol and ammonium hydroxide, and acetate groups are removed with triethylamine-methanol-water to provide 15. Acylation with the appropriate acid chloride [$Br(CH2)_nCOCl$] followed by reaction with taurine provides the final product 16. It is noted that in this scheme the taurine is for illustration and that a large variety of functional groups can be substituted in its place.

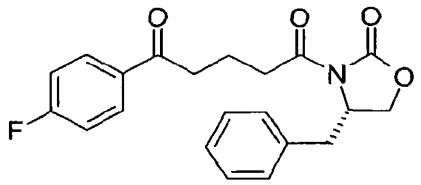
Scheme III



[00126] Synthesis of Intermediate 20: 3-Allyloxyphenyl lithium is reacted with glucopyranolactone 17, followed by reductive cleavage of the hemiketal with triethylsilane and boron trifluoride diethyl etherate to provide benzyl-protected glycoside 18. Removal of the allyl group with palladium catalyst and tri-n-butyltin hydride followed by hydrogenation using palladium on carbon under a hydrogen atmosphere provides phenyl glycoside 19. Reaction with N-phenyltrifluoromethanesulfonimide provides the triflate and peracetylation using acetic anhyride in pyridine afford intermediate 20.

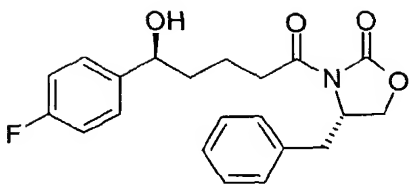


[00127] Example 35. (4*S*)-4-Benzyl-3-[5-(4-fluorophenyl)-5-oxopentanoyl]-1,3-oxazolidin-2-one



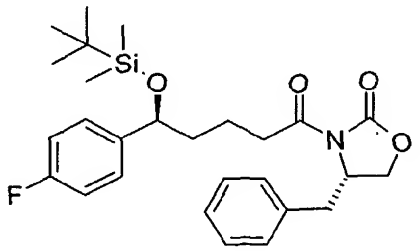
5-(4-Fluorophenyl)-5-oxopentanoic acid (10.08 g, 47.9 mmol) and triethylamine (6.8 mL, 4.94 g, 48.8 mmol) were dissolved in tetrahydrofuran (50 mL). The reaction was cooled to –5 °C (ice/brine bath), trimethylacetyl chloride (6.0 mL, 5.87 g, 48.7 mmol) was added quickly drop-wise and the mixture was warmed to room temperature and stirred for 1.5 h. The reaction was cooled to –5 °C (ice/brine bath) again for 30 min, filtered through Celite®, washed with cold 1:1 hexane-tetrahydrofuran (60 mL) and hexane (120 mL). The filtrate was concentrated, dissolved in *N*,*N*-dimethylformamide (16 mL) and to this mixture was added (*S*)-benzyl-2-oxazolidinone (8.47 g, 47.8 mmol) and 4-dimethylaminopyridine (8.57 g, 70.2 mmol) as solids. The reaction was stirred at room temperature for 20 h, poured into 1.0 N hydrochloric acid (400 mL) and extracted with ethyl acetate (2 x 300 mL). The organic layer was washed with water (400 mL), quarter saturated sodium bicarbonate solution (400 mL), brine (200 mL), dried over sodium sulfate, filtered, and concentrated. The residue was purified by crystallization from hot isopropyl alcohol (75 mL) with slow cooling to room temperature over 16 h. The crystals were filtered cold and washed with cold isopropyl alcohol (50 mL) to afford (4*S*)-4-benzyl-3-[5-(4-fluorophenyl)-5-oxopentanoyl]-1,3-oxazolidin-2-one (13.87 g, 78% yield) as a white crystalline solid; mp 114.5 °C; R_f 0.29 (1:2 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.03-7.98 (m, 2H), 7.37-7.19 (m, 5H), 7.14 (t, J = 8.7 Hz, 2H), 4.72-4.64 (m, 1H), 4.25-4.15 (m, 2H), 3.32 (dd, J = 13.3, 3.4 Hz, 1H), 3.12-3.01 (m, 4H), 2.78 (dd, J = 13.3, 9.6 Hz, 1H), 2.15 (quint., J = 7.2 Hz, 2H) ppm

[00128] Example 36. (4*S*)-4-Benzyl-3-[(5*S*)-5-(4-fluorophenyl)-5-hydroxypentanoyl]-1,3-oxazolidin-2-one



(4*S*)-4-Benzyl-3-[5-(4-fluorophenyl)-5-oxopentanoyl]-1,3-oxazolidin-2-one (13.87 g, 37.54 mmol) was dissolved in dichloromethane (40 mL). Into a separate flask were added borane-methyl sulfide complex (3.6 mL, ~38 mmol), 1.0 M ®-1-methyl-3,3-diphenyltetrahydro-3*H*-pyrrolo[1,2-*c*][1,3,2]oxazaborole in toluene (1.9 mL, 1.9 mmol) and dichloromethane (20 mL). This mixture was cooled to –5 °C (ice/methanol bath) and the ketone solution was added drop-wise via cannula over 5 min. The reaction was stirred at –5 °C for 5.5 h and then quenched by slow addition of methanol (9 mL), 5% hydrogen peroxide solution (30 mL) and 1 M aqueous sulfuric acid (20 mL) respectively. The reaction was poured into water (500 mL) and extracted with ethyl acetate (500 mL). The organic layer was washed with water (500 mL), 0.1 N hydrochloric acid (300 mL) and brine (300 mL), dried over sodium sulfate, filtered, and concentrated to afford (4*S*)-4-benzyl-3-[(5*S*)-5-(4-fluorophenyl)-5-hydroxypentanoyl]-1,3-oxazolidin-2-one, which was used in subsequent reactions without further purification; R_f 0.14 (1:2 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.37-7.24 (m, 5H), 7.19 (d, J = 7.3 Hz, 2H), 7.02 (t, J = 8.9 Hz, 2H), 4.72-4.61 (m, 2H), 4.21-4.13 (m, 2H), 3.27 (dd, J = 13.2, 3.0 Hz, 1H), 2.99-2.94 (m, 2H), 2.74 (dd, J = 13.2, 9.6 Hz, 1H), 2.27 (br s, 1H), 1.88-1.66 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 354.0

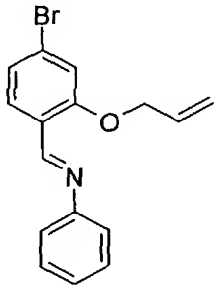
[00129] Example 37. (4*S*)-4-Benzyl-3-[(5*S*)-5-{[*tert*-butyl(dimethyl)silyl]oxy}-5-(4-fluorophenyl)pentanoyl]-1,3-oxazolidin-2-one



(4*S*)-4-Benzyl-3-[(5*S*)-5-(4-fluorophenyl)-5-hydroxypentanoyl]-1,3-oxazolidin-2-one (37.54 mmol) was dissolved in *N*,*N*-dimethylformamide (40 mL) and then imidazole

(2.97 g, 43.6 mmol) and *tert*-butyldimethylsilyl chloride (6.12 g, 40.6 mmol) were added. The reaction was stirred at room temperature for 19 h, poured into 0.1 N hydrochloric acid (500 mL) and extracted with 1:1 ethyl acetate-hexane (500 mL). The organic layer was washed with water (2 x 500 mL), brine (300 mL), dried over sodium sulfate, filtered, and concentrated. The residue was purified by crystallization from methanol (55 mL) by heating to a light boil and cooling slowly to room temperature over 18 h. The crystals were filtered cold and washed with cold methanol (45 mL) to afford (4*S*)-4-benzyl-3-[(5*S*)-5-{[*tert*-butyl(dimethyl)silyl]oxy}-5-(4-fluorophenyl)pentanoyl]-1,3-oxazolidin-2-one (16.04 g, 88% yield) as a white crystalline solid; mp 87.6 °C; R_f 0.66 (1:2 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.36-7.18 (m, 7H), 6.99 (t, J = 8.7 Hz, 2H), 4.69-4.61 (m, 2H), 4.18-4.13 (m, 2H), 3.27 (dd, J = 13.5, 3.2 Hz, 1H), 2.96-2.89 (m, 2H), 2.73 (dd, J = 13.5, 9.7 Hz, 1H), 1.82-1.63 (m, 4H), 0.88 (s, 9H), 0.04 (s, 3H), -0.15 (s, 3H) ppm; MS $[M\text{-}OSi(CH_3)_2C(CH_3)_3]^+$ 354.0

[00130] Example 38. *N*-{(1*E*)-[2-(Allyloxy)-4-bromophenyl]methylene}aniline

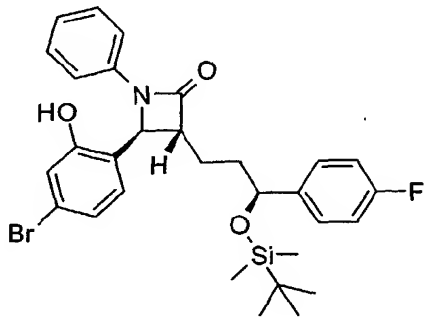


4-Bromosalicylaldehyde (4.02 g, 20.0 mmol) [prepared from 3-bromophenol analogous to the procedure of Casiraghi, et. al. *Journal of the Chemical Society, Perkin Transactions 1: Organic and Bio-Organic Chemistry* (1978), 318-21] was dissolved in anhydrous *N,N*-dimethylformamide (13 mL). Potassium carbonate (3.9 g, 28.0 mmol) was added as a solid to give a yellow suspension. Allyl bromide (2.6 mL, 3.63 g, 30.0 mmol) was added via syringe. The reaction stirred for 17 h at room temperature and was then diluted with water and extracted three times with 1:1 ethyl acetate-hexane. The combined organic layers were washed with water (5x), brine, dried over sodium sulfate, filtered and concentrated to afford 2-(allyloxy)-4-bromobenzaldehyde (4.83 g, 100% yield) as a

yellow solid which was used without further purification in the next step; R_f 0.38 (1:9 ethyl acetate-hexane); MS $[M+H]^+$ 241.0

[00131] 2-(Allyloxy)-4-bromobenzaldehyde (5.05 g, 20.9 mmol) was dissolved with warming in isopropanol (18 mL). Freshly distilled aniline (1.99 g, 21.3 mmol) was added with isopropanol (4 mL) and the reaction was heated to 50 °C. A yellow precipitate formed within 30 min and isopropanol (5 mL) was added to aid stirring. The reaction was stirred at 50 °C for 16 h, by which time proton NMR showed no aldehyde present. The reaction was cooled with stirring. The mixture was diluted with hexane (20 mL), the solid was filtered and washed with the mother liquor, washed with hexane and air dried to afford *N*-{(1*E*)-[2-(allyloxy)-4-bromophenyl]methylene}aniline (5.69 g, 86% yield) as a light yellow powder; ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.87 (s, 1H), 8.03 (d, J = 8.4 Hz, 1H), 7.43-7.36 (m, 2H), 7.27-7.17 (m, 4H), 7.099 (d, J = 1.8 Hz, 1H), 6.06 (ddt, J = 17.2, 10.5, 5.3 Hz, 1H), 5.43 (AB q, J = 17.3, 3.0 Hz, 1H), 5.33 (AB q, J = 10.5, 2.8 Hz, 1H), 4.62 (ddd, J = 5.2, 1.5, 1.5 Hz, 2H) ppm

[00132] Example 39. (3*R*,4*S*)-4-(4-Bromo-2-hydroxyphenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one



2-(Allyloxy)-4-bromobenzaldehyde (2.79 g, 8.83 mmol) and (4*S*)-4-Benzyl-3-[(5*S*)-5-{[*tert*-butyl(dimethyl)silyl]oxy}-5-(4-fluorophenyl)pentanoyl]-1,3-oxazolidin-2-one (3.3 g, 6.8 mmol) were combined in a 100-mL 3-neck round bottom flask fitted with a thermometer and nitrogen inlet. Anhydrous dichloromethane (60 mL) was added to give a light yellow solution which was cooled to –30 °C. Diisopropylethylamine (2.3 mL, 1.71 g, 13.2 mmol) was added via syringe. Titanium tetrachloride (0.86 mL, 1.48 g, 7.82 mmol) was added dropwise over 6 min at an internal temperature between –28° to –26 °C

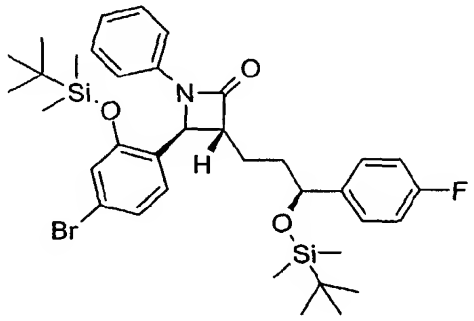
to give a reddish brown solution. The reaction stirred under nitrogen for 3 h between –30 to –25 °C and was then cooled to –35 °C and quenched slowly with glacial acetic acid (6 mL) over 6 min. The reaction was poured into a cold (0 °C) 7% tartaric acid solution (125 mL). Ethyl acetate (200mL) was added and the mixture was warmed to room temperature with stirring. A 5% sodium sulfite solution (60mL) was added and the layers were separated. The aqueous layer was extracted with ethyl acetate (2 x 200mL). The combined organic layers were washed with a saturated sodium bicarbonate solution, water and brine, dried over sodium sulfate, filtered and concentrated. The residue was purified by chromatography (120 g silica gel, 1% to 90% ethyl acetate-hexane) to afford (4*S*)-3-[(2*R*,5*S*)-2-[(*S*)-[2-(allyloxy)-4-bromophenyl](anilino)methyl]-5-{[*tert*-butyl(dimethyl)silyl]oxy}-5-(4-fluorophenyl)pentanoyl]-4-benzyl-1,3-oxazolidin-2-one (4.54 g, 83% yield); R_f 0.38 (1:4 ethyl acetate-hexane); MS $[M+H]^+$ 801.0

[00133] (4*S*)-3-[(2*R*,5*S*)-2-[(*S*)-[2-(Allyloxy)-4-bromophenyl](anilino)methyl]-5-{[*tert*-butyl(dimethyl)silyl]oxy}-5-(4-fluorophenyl)pentanoyl]-4-benzyl-1,3-oxazolidin-2-one (1.2 g, 1.5 mmol) was dissolved in anhydrous methyl *tert*-butyl ether (10 mL) and stirred at room temperature under nitrogen. *N*,*O*-bistrimethylsilylacetamide (1.1 mL, 4.5 mmol) was added followed by a catalytic amount (~5 mg) of tetrabutylammonium fluoride trihydrate. The reaction was stirred at room temperature for 19 h, quenched at room temperature with glacial acetic acid (160 μL) and partitioned between ethyl acetate and water and separated. The aqueous layer was extracted with ethyl acetate. The combined organic layers were washed with a saturated sodium bicarbonate solution, water, brine, dried over sodium sulfate, filtered and concentrated. The residue was purified by chromatography (120 g silica gel, 1% to 85% ethyl acetate-hexane) to afford (3*R*,4*S*)-4-[2-(allyloxy)-4-bromophenyl]-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (816 mg, 87% yield); R_f 0.56 (1:4 ethyl acetate-hexane)

[00134] (3*R*,4*S*)-4-[2-(Allyloxy)-4-bromophenyl]-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (1.34 g, 2.15 mmol) was dissolved in deoxygenated tetrahydrofuran (20 mL). Morpholine (1.8 mL, 1.8 g, 20.6 mmol) was added with additional deoxygenated tetrahydrofuran (5 mL). The

reaction was purged with nitrogen and tetrakis(triphenylphosphine)palladium(0) (220 mg, 0.19 mmol) was added. The reaction was purged with nitrogen again. After 1.5 h at room temperature the reaction was diluted with ethyl acetate, washed twice with 1 N hydrochloric acid, saturated sodium bicarbonate solution, water and brine, dried over sodium sulfate and filtered. The solution was treated with activated charcoal, filtered, concentrated and purified by chromatography (40 g silica gel, 6% to 80% ethyl acetate-hexane) to afford (3*R*,4*S*)-4-(4-bromo-2-hydroxyphenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (1.04 g, 83% yield); R_f 0.38 (1:4 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.28-7.18 (m, 6H), 7.09-6.92 (m, 6H), 5.91 (s, 1H), 4.93 (d, J = 2.3 Hz, 1H), 4.65 (t, J = 5.4 Hz, 1H), 3.06 (ddd, J = 4.8, 2.3, 2.3 Hz, 1H), 1.98-1.77 (m, 4H), 0.86 (s, 9H), 0.006 (s, 3H), -0.16 (s, 3H) ppm; MS $[M-H]^+$ 581.7

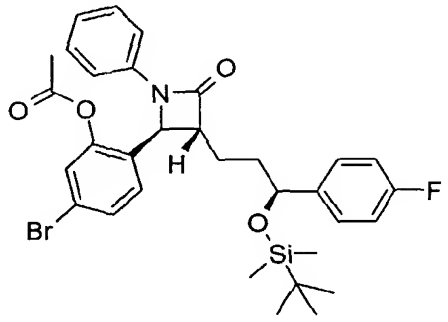
[00135] Example 40. (3*R*,4*S*)-4-(4-Bromo-2-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one



(3*R*,4*S*)-4-(4-Bromo-2-hydroxyphenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy} -3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (1.04 g, 1.79 mmol) was dissolved in anhydrous dichloromethane (5 mL), anhydrous *N*,*N*-dimethylformamide (5 mL) and stirred under nitrogen at room temperature. 2,6-Lutidine (1.0 mL, 920 mg, 8.6 mmol) was added followed by drop-wise addition of *tert*-butyldimethylsilyl trifluromethane sulfonate (1.2 mL, 1.38 g, 5.22 mmol). The reaction was stirred under nitrogen at room temperature for 2.25 h. 2,6-Lutidine (0.25 mL, 230 mg, 2.15 mmol) was added followed by addition of *tert*-butyldimethylsilyl trifluromethane sulfonate (0.4 mL, 460 mg, 1.74 mmol) and after a total of 4.5 h at room temperature the reaction was diluted with ethyl

acetate and water and the layers were separated. The aqueous layer was extracted with ethyl acetate and the combined organic layers were washed with 0.5 N hydrochloric acid, saturated sodium bicarbonate solution, water (4 times) and brine, dried over sodium sulfate, filtered, concentrated and purified by chromatography (40 g silica gel, 1% to 85% ethyl acetate-hexane) to afford (3*R*,4*S*)-4-(4-bromo-2-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (1.23 g, 99% yield); R_f 0.57 (1:4 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.14 (m, 6H), 7.09-6.91 (m, 6H), 4.99 (d, J = 2.3 Hz, 1H), 4.62 (t, J = 5.6 Hz, 1H), 3.06 (ddd, J = 4.9, 2.5, 2.3 Hz, 1H), 1.97-1.69 (m, 4H), 1.03 (s, 9H), 0.84 (s, 9H), 0.33 (s, 3H), 0.29 (s, 3H), -0.01 (s, 3H), -0.20 (s, 3H) ppm

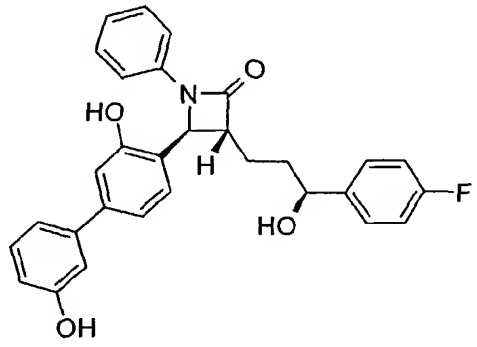
[00136] Example 41. 5-Bromo-2-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate



(3*R*,4*S*)-4-(4-Bromo-2-hydroxyphenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (293 mg, 0.50 mmol) was dissolved in anhydrous dichloromethane (3 mL). 4-Dimethylaminopyridine (183 mg, 1.5 mmol) was added followed by acetic anhydride (280 μL, 302 mg, 3.0 mmol). After 1 h the reaction was filtered through a plug of silica gel and eluted with dichloromethane. The solvent was concentrated, azeotroped with toluene and purified by chromatography (40 g silica gel, 1% to 85% ethyl acetate-hexane) to afford 5-bromo-2-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate (245 mg, 78% yield); R_f 0.47 (1:4 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.38-7.16 (m, 9H), 7.14-6.94 (m, 3H), 4.69 (t, J = 5.4 Hz, 1H), 4.64 (d, J = 2.3

Hz, 1H), 3.06 (ddd, J = 4.7, 2.3, 2.2 Hz, 1H), 2.30 (s, 3H), 1.97-1.78 (m, 4H), 0.89 (s, 9H), 0.032 (s, 3H), -0.14 (s, 3H) ppm; MS $[M\text{-}OSi(CH_3)_2C(CH_3)_3]^+$ 493.8

[00137] Example 42. (3*R*,4*S*)-4-(3,3'-Dihydroxybiphenyl-4-yl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one



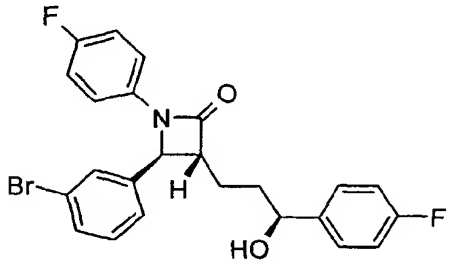
[00138] Using Suzuki coupling methodology, 5-Bromo-2-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate (100 mg, 0.16 mmol) was combined with 3-hydroxyphenyl boronic acid (29 mg, 0.21 mmol) with deoxygenated toluene (3 mL) and deoxygenated ethanol (1 mL). 2.0 M aqueous potassium carbonate (0.31 mL, 0.31 mmol) was added and the vessel was purged with nitrogen. Tetrakis(triphenylphosphine)palladium(0) (9 mg, 0.008 mmol) was added and the vessel purged again. The reaction was heated to 70 °C for 1.5 h, cooled, diluted with water and extracted with ethyl acetate (2 x). The combined organic layers were washed with water, brine, dried over sodium sulfate, filtered, concentrated and purified by chromatography (40 g silica gel, 20% to 90% ethyl acetate-hexane) to afford 4-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl acetate (70 mg, 69% yield)); R_f 0.34 (1:2 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.34-7.17 (m, 10H), 7.06-6.90 (m, 5H), 6.79 (ddd, J = 8.1, 2.5, 0.8 Hz, 1H), 6.03 (br s, 1H), 4.67 (d, J = 2.3 Hz, 1H), 4.64 (t, J = 5.6 Hz, 1H), 3.26 (ddd, J = 4.8, 2.5, 2.4 Hz, 1H), 2.27 (s, 3H), 1.94-1.73 (m, 4H), 0.84 (s, 9H), -0.02 (s, 3H), -0.19 (s, 3H) ppm; MS $[M\text{-}OSi(CH_3)_2C(CH_3)_3]^+$ 508.0

[00139] 4-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-Butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl acetate (70

mg, 0.11 mmol) was dissolved in methanol (2.45 mL). Water (0.73 mL) was added dropwise followed by triethylamine (2.2 mL) and the reaction stirred at room temperature for 1 h. Toluene (3 mL) and methanol (5 mL) were added and the reaction was concentrated to give 69 mg of crude (3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-(3,3'-dihydroxybiphenyl-4-yl)-1-phenylazetidin-2-one which was used without further purification.

[00140] (3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-Butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-(3,3'-dihydroxybiphenyl-4-yl)-1-phenylazetidin-2-one (73 mg , 0.122 mmol) was dissolved in acetonitrile (5 mL) and transferred to a polypropylene conical vial. 48% Hydrofluoric acid (1 mL) was added dropwise and the reaction stirred at room temperature for 1 h. The reaction was quenched with 1 N sodium hydroxide (24 mL) and transferred to a flask containing pH 7.4 phosphate buffer (24 mL). The pH of the solution was adjusted to 7.5-8.0 with saturated sodium bicarbonate solution then extracted with ethyl acetate (3x). The combined organic layers were washed with saturated sodium bicarbonate solution (2x), water, brine, dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 40% to 100% ethyl acetate-hexane) to afford (3*R*,4*S*)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (53 mg, 69% yield)); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.30-7.13 (m, 7H), 7.08-6.85 (m, 8H), 6.78 (ddd, J = 8.1, 2.3, 0.9 Hz, 1H), 5.04 (d, J = 2.3 Hz, 1H), 4.61 (t, J = 5.9 Hz, 1H), 3.07 (ddd, J = 5.7, 1.8, 1.5 Hz, 1H), 2.08-1.80 (m, 4H) ppm; MS $[M+H]^+$ 584.0 $[M-H]^-$ 582.0

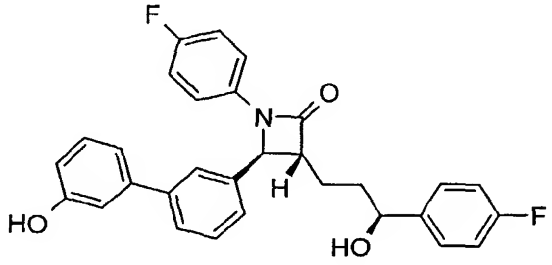
[00141] Example 43. (3*R*,4*S*)-4-(3-bromophenyl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one



Synthesized using a similar procedure as Example 39 starting from 4-fluoroaniline and 3-

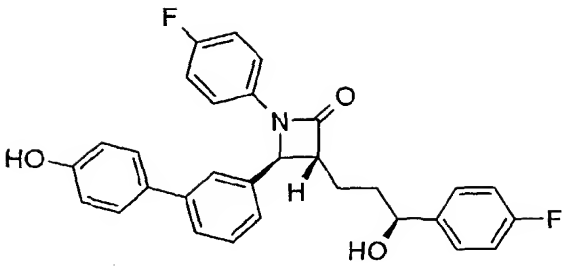
bromobenzaldehyde. The benzylic TBDMS protecting group was removed using 48% hydrofluoric acid as described in Example 42. Purified by chromatography (silica gel, 10% to 60% ethyl acetate-hexane) to afford (3*R*,4*S*)-4-(3-bromophenyl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (86 mg); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.50-7.45 (m, 2H), 7.33-7.18 (m, 6H), 7.07-6.91 (m, 4H), 4.72 (t, J = 5.8 Hz, 1H), 4.57 (d, J = 2.4 Hz, 1H), 3.10 (ddd, J = 4.8, 2.4, 2.4 Hz, 1H), 2.12 (br s, 1H), 2.06-1.86 (m, 4H) ppm; MS $[M+HCO_2^-]^-$ 516.0

[00142] Example 44. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-3-yl)azetidin-2-one



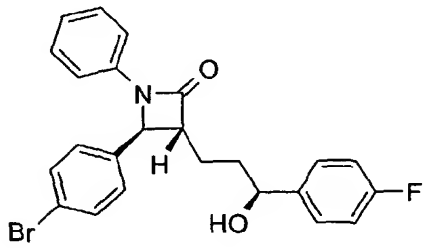
(3*R*,4*S*)-4-(3-Bromophenyl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (43 mg, 0.091 mmol) was coupled with 3-hydroxyphenyl boronic acid (18 mg, 0.13 mmol) under standard Suzuki conditions illustrated by Example 42. Purified by chromatography (silica gel, 10% to 90% ethyl acetate-hexane) to afford (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-3-yl)azetidin-2-one (19.7 mg, 45% yield); R_f 0.30 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.57-7.40 (m, 3H), 7.34-7.22 (m, 6H), 7.10 (ddd, 7.7, 1.6, 0.9 Hz 1H), 7.04-6.90 (m, 5H), 6.84 (ddd, J = 8.2, 2.6, 0.9 Hz, 1H), 5.10 (br s, 1H), 4.72 (t, J = 5.9 Hz, 1H), 4.67 (d, J = 2.4 Hz, 1H), 3.16 (ddd, J = 5.0, 2.6, 2.4 Hz, 1H), 2.26 (br s, 1H), 2.08-1.88 (m, 4H) ppm

[00143] Example 45. (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-hydroxybiphenyl-3-yl)azetidin-2-one



(3*R*,4*S*)-4-(3-Bromophenyl)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one (42 mg, 0.089 mmol) was coupled with 4-hydroxyphenyl boronic acid (18 mg, 0.13 mmol) under standard Suzuki conditions illustrated by Example 42. Purified by chromatography (silica gel, 10% to 90% ethyl acetate-hexane) to afford (3*R*,4*S*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-hydroxybiphenyl-3-yl)azetidin-2-one (27 mg, 63% yield); R_f 0.31 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.54-7.37 (m, 6H), 7.32-7.22 (m, 4H), 7.04-6.87 (m, 6H), 5.24 (br s, 1H), 4.72 (t, J = 6.0 Hz, 1H), 4.67 (d, J = 2.4 Hz, 1H), 3.17 (ddd, J = 5.3, 2.5, 2.4 Hz, 1H), 2.26 (br s, 1H), 2.09-1.88 (m, 4H) ppm

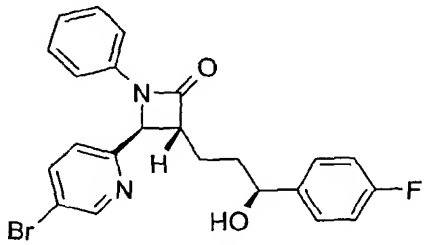
[00144] Example 46. (3*R*,4*S*)-4-(4-Bromophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one



Synthesized using a similar procedure as Example 39 starting from aniline and 4-bromobenzaldehyde. The benzylic TBDMS protecting group was removed using 48% hydrofluoric acid as described in Example 42. Purification by chromatography (40 g silica gel, 10% to 90% ethyl acetate-hexane) afforded (3*R*,4*S*)-4-(4-bromophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (982.6 mg, 75% overall yield) as a clear film; R_f 0.45 (2:3 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.49 (d, J = 8.3 Hz, 2H), 7.31-7.19 (m, 8H), 7.07-6.98 (m, 3H), 4.70 (t, J = 6.1 Hz, 1H), 4.61 (d, J = 2.5 Hz, 1H), 3.04 (dt, J = 7.4, 2.3 Hz, 1H), 2.24 (br s, 1H), 2.03-1.86 (m, 4H)

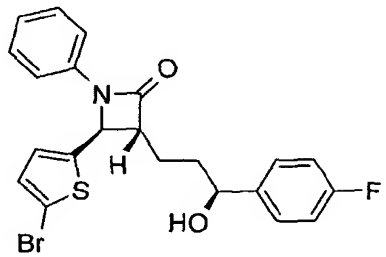
ppm

[00145] Example 47. (3*R*,4*S*)-4-(5-Bromopyridin-2-yl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one



Synthesized using the same procedure as Example 39 starting from aniline and 5-bromo-2-pyridinecarboxaldehyde (prepared using a procedure described by Wang et. al., *Tetrahedron Letters* 41 (2000), 4335-4338). The benzylic TBDMS protecting group was removed using 48% hydrofluoric acid as described in Example 42. Purification by chromatography (12 g silica gel, 15% to 90% ethyl acetate-hexane) afforded (3*R*,4*S*)-4-(5-bromopyridin-2-yl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (23.3 mg, 3% overall yield) as a clear film; R_f 0.07 (1:4 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.66 (d, J = 2.3 Hz, 1H), 7.80 (dd, J = 8.3, 2.3 Hz, 1H), 7.34-7.29 (m, 3H), 7.24-7.17 (m, 4H), 7.09-6.99 (m, 3H), 4.82 (d, J = 2.5 Hz, 1H), 4.75-4.71 (m, 1H), 3.21 (dt, J = 7.0, 2.3 Hz, 1H), 2.31-1.89 (m, 5H) ppm

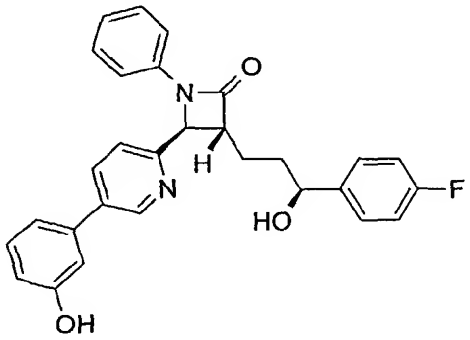
[00146] Example 48. (3*R*,4*S*)-4-(5-Bromo-2-thienyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one



Synthesized using the same procedure as Example 39 starting from aniline and 5-bromo-2-thiophenecarboxaldehyde. The benzylic TBDMS protecting group was removed using 48% hydrofluoric acid as described in Example 42. Purification by chromatography (40 g silica gel, 15% to 90% ethyl acetate-hexane) afforded (3*R*,4*S*)-4-(5-bromo-2-thienyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (212.4 mg, 23%

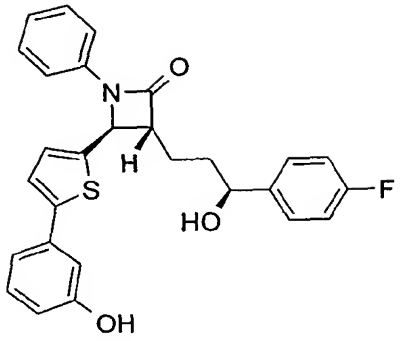
overall yield) as a white solid; R_f 0.13 (1:4 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.36-7.21 (m, 6H), 7.10-7.06 (m, 1H), 7.02 (t, J = 8.7 Hz, 2H), 6.89 (dd, J = 19.7, 3.8 Hz, 2H), 4.83 (d, J = 2.4 Hz, 1H), 4.71 (t, J = 5.7 Hz, 1H), 3.25-3.19 (m, 1H), 2.20 (br s, 1H), 2.01-1.83 (m, 4H) ppm

[00147] Example 49. (3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-[5-(3-hydroxyphenyl)pyridin-2-yl]-1-phenylazetidin-2-one



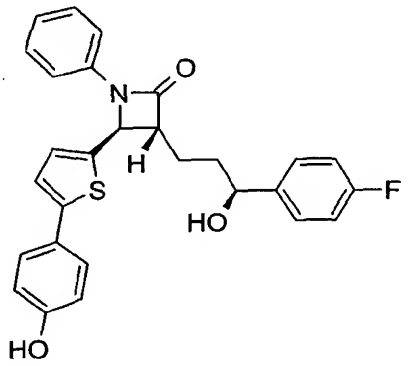
(3*R*,4*S*)-4-(5-Bromopyridin-2-yl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (23 mg, 0.051 mmol) was coupled with 3-hydroxyphenyl boronic acid (9.2 mg, 0.067mmol) under standard Suzuki conditions illustrated by Example 42. Purification by chromatography (4 g silica gel, 15% to 100% ethyl acetate-hexane) afforded (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[5-(3-hydroxyphenyl)pyridin-2-yl]-1-phenylazetidin-2-one (20.7 mg, 87% yield) as a clear film; R_f 0.14 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.88 (d, J = 2.2 Hz, 1H), 7.88 (dd, J = 8.2, 2.3 Hz, 1H), 7.86-7.80 (m, 1H), 7.39-7.22 (m, 7H), 7.12-7.02 (m, 3H), 6.96 (t, J = 8.7 Hz, 2H), 6.96-6.91 (m, 1H), 4.97 (d, J = 2.3 Hz, 1H), 4.76-4.72 (m, 1H), 3.28-3.22 (m, 1H), 3.20 (br s, 1H), 2.17-1.90 (m, 4H), 1.80 (br s, 1H) ppm; MS $[M+H]^+$ 469.0

[00148] Example 50. (3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-[5-(3-hydroxyphenyl)-2-thienyl]-1-phenylazetidin-2-one



(3*R*,4*S*)-4-(5-Bromo-2-thienyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (90.2 mg, 0.196 mmol) was coupled with 3-hydroxyphenyl boronic acid (32.2 mg, 0.233 mmol) under standard Suzuki conditions illustrated by Example 42. Purification by chromatography (12 g silica gel, 15% to 100% ethyl acetate-hexane) afforded (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[5-(3-hydroxyphenyl)-2-thienyl]-1-phenylazetidin-2-one (77.6 mg, 84% yield) as a clear foam; R_f 0.36 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, CD_3OD) δ 7.31-6.93 (m, 14H), 6.70 (ddd, J = 8.0, 2.3, 1.0 Hz, 1H), 4.89-4.88 (m, 1H), 4.64-4.59 (m ,1H), 3.77 (br s, 2H), 3.25-3.21 (m, 1H), 1.97-1.83 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 456.0

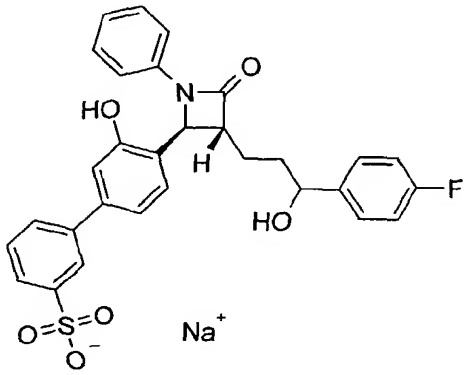
[00149] Example 51. (3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-[5-(4-hydroxyphenyl)-2-thienyl]-1-phenylazetidin-2-one



(3*R*,4*S*)-4-(5-Bromo-2-thienyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (69.8 mg, 0.152 mmol) was coupled with 4-hydroxyphenyl boronic acid (25.2 mg, 0.183 mmol) under standard Suzuki conditions illustrated by Example 42. Purification by chromatography (12 g silica gel, 15% to 100% ethyl acetate-hexane) afforded (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[5-(4-hydroxyphenyl)-2-

thienyl]-1-phenylazetidin-2-one (40.7 mg, 56% yield) as a clear foam; R_f 0.39 (1:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.64-7.60 (m, 4H), 7.56-7.48 (m, 5H), 7.33-7.27 (m, 2H), 7.25-7.20 (m, 2H), 7.07 (d, J = 8.6 Hz, 2H), 6.81 (br s, 1H), 5.14 (d, J = 2.3 Hz, 1H), 5.00-4.95 (m, 1H), 3.57-3.50 (m, 1H), 2.29-2.11 (m, 4H) ppm; MS $[M+H]^+$ 474.0

[00150] Example 53. Sodium 4'-{(2*S*,3*R*)-3-[(3*S*/*R*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonate



5-Bromo-2-{(2*S*,3*R*)-3-[(3S)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate (140.0 mg, 0.223 mmol) was dissolved in acetonitrile (8.0 mL) and 48% hydrofluoric acid (0.8 mL) into a polypropylene Falcon® tube. The reaction was stirred for 4 h at room temperature and then poured into 0.5 M potassium phosphate (50 mL), extracted with 1:1 ethyl acetate-hexane (50 mL), washed with saturated sodium bicarbonate solution (50 mL) and brine (50 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (12 g silica gel, 15% to 90% ethyl acetate-hexane) to afford 5-bromo-2-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate (114.5 mg, 100% yield) as a clear foam; R_f 0.11 (1:4 ethyl acetate-hexane).

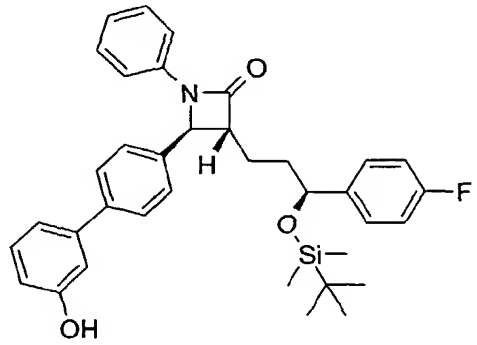
[00151] 5-Bromo-2-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate (114.5 mg, 0.223 mmol) and 3-thioanisoleboronic acid (48.3 mg, 0.287 mol) were dissolved in toluene (3.0 mL) and ethanol (1.5 mL). A solution of 2.0 M aqueous sodium carbonate (0.215 mL, 0.43 mmol) and solid tetrakis(triphenylphosphine)palladium(0) (14.4 mg, 0.0125 mmol) were added and the vessel was vacuum/nitrogen purged (3x). The reaction was stirred vigorously for 4 h at

60 °C under a nitrogen atmosphere and then poured into 0.2 N hydrochloric acid (50 mL), extracted with 1:1 ethyl acetate-hexane (75 mL), washed with brine (50 mL), dried over sodium sulfate, filtered and concentrated to afford a mixture of products which was used directly in the next step; R_f 0.79 (2:1 ethyl acetate-hexane) for (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3-hydroxy-3'-(methylthio)biphenyl-4-yl]-1-phenylazetidin-2-one and 0.84 (2:1 ethyl acetate-hexane) for 4-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-(methylthio)biphenyl-3-yl acetate.

[00152] A 1:1 mixture of (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3-hydroxy-3'-(methylthio)biphenyl-4-yl]-1-phenylazetidin-2-one and 4-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-(methylthio)biphenyl-3-yl acetate (0.223 mmol) was dissolved in dichloromethane (10 mL) and cooled to 0 °C. 3- Chloroperoxybenzoic acid (64.3 mg, 0.373 mmol) was added in portions while monitoring by LCMS to make the arylsulfoxide. Once addition was complete the reaction was poured into quarter saturated sodium bicarbonate solution (50 mL), extracted with 1:1 ethyl acetate-hexane (75 mL), washed brine (50 mL), dried over sodium sulfate, filtered and concentrated. The residue was dissolved in dichloromethane (10 mL) and the Pummerer rearrangement was effected by the addition of trifluoroacetic anhydride (100 μL, 148.7 mg, 0.708 mmol). The reaction was stirred at room temperature for 4 h and then 3- chloroperoxybenzoic acid (121.7 mg, 0.705 mmol) was added to convert to the sulfone. The mixture was stirred for 15 min at room temperature, concentrated and dissolved in 3:3:1 methanol-triethylamine-water (7 mL) to hydrolyze the acetate and trifluoroacetate groups. The reaction was stirred for 2 h at room temperature, concentrated and dissolved in dichloromethane (10 mL). 3- Chloroperoxybenzoic acid (49.2 mg, 0.285 mmol) was added to oxidize the compound to the sulfonic acid. The reaction was stirred for 10 min at room temperature, diluted with 1:1 ethyl acetate-hexane (50 mL) and extracted with 1% saturated sodium bicarbonate solution (3 x 50 mL). The aqueous layer was acidified with 1.0 N hydrochloric acid (~10 mL), extracted with ethyl acetate (2 x 75 mL), diluted with triethylamine (1.0 mL), concentrated, purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 25% to 100%

acetonitrile-0.1% trifluoroacetic acid in water) and passed through Dowex® sodium ion exchange resin to afford sodium 4'-{(2*S*,3*R*)-3-[(3*S*/*R*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonate (45.3 mg, 36% yield) as an off-white solid; ^{1}H NMR (300 MHz, CD_3OD) δ 8.04-6.98 (m, 16H), 5.17 (d, J = 2.2 Hz, 0.66H), 5.14 (d, J = 2.2 Hz, 0.33H), 4.70-4.60 (m, 1H), 3.21-3.14 (m, 1H), 2.09-1.89 (m, 4H) ppm; MS $[M-Na]^-$ 546.0

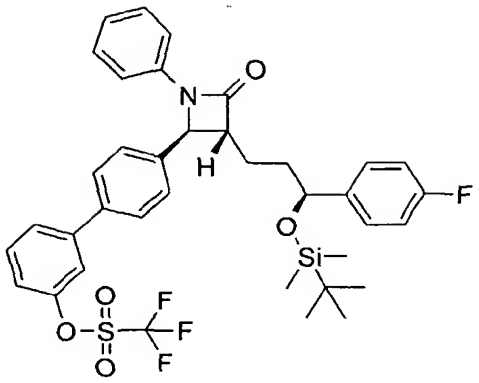
[00153] Example 54. (3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-Butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one



(3*R*,4*S*)-4-(3'-{[*tert*-Butyl(dimethyl)silyl]oxy}biphenyl-4-yl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (0.60 g, 0.86 mmol) was stirred at room temperature in dry methanol (20 mL) under a nitrogen atmosphere. Potassium fluoride (0.10 g, 1.72 mmol) was added and the reaction mixture was stirred 1.5 h at room temperature. The solution was poured into ethyl acetate and washed successively with water (2x), 10% aqueous sodium bicarbonate, water and brine. The organic solution was dried over sodium sulfate, filtered, concentrated and purified by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% ethyl acetate to 50%) to afford (3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one (0.46 g, 92%) as a white foam; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.57 (d, J = 8.2, Hz, 2H,) 7.37 (d, J = 8.2 Hz, 2H), 6.9-7.4 (m, 12H), 6.8 (m, 1H), 4.9 (br s, 1H), 4.67 (t, J = 6.0 Hz, 1H), 4.63 (d, J = 2.5 Hz, 1H), 3.0-3.1 (m, 1H), 1.8-2.0 (m, 4H), 0.87 (s, 9H), 0.02 (s, 3H), -0.16 (s, 3H)

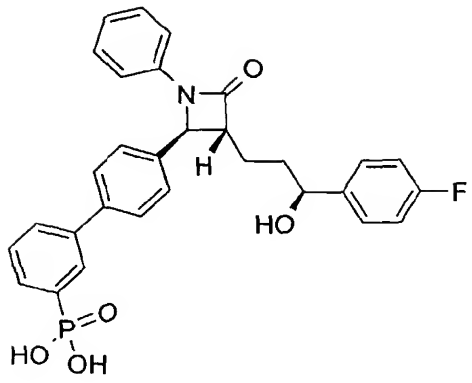
[00154] Example 55. 4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-Butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl

trifluoromethanesulfonate



(3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-Butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one (0.46 g, 0.79 mmol) was stirred at room temperature in dry dichloromethane (15 mL) under a nitrogen atmosphere. *N*-Phenyltrifluoromethanesulfonimide (0.39 g, 1.09 mmol), triethylamine (0.23 mL, 1.65 mmol) and 4-(dimethylamino)pyridine (0.02 g, 0.2 mmol) were added in succession and the reaction mixture was stirred 2 h at room temperature. The solution was poured into 0.5N aqueous hydrochloric acid (20 mL) and extracted with ethyl acetate. The organic phase was washed successively with water, 10% aqueous sodium bicarbonate, water and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed *in vacuo* to afford 4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl trifluoromethanesulfonate as a white foam (0.56 g, 100%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% ethyl acetate to 50%) ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.9-7.3 (*m*, 17H), 4.68 (t, J = 5.7 Hz, 1H), 4.65 (d, J = 2.5 Hz, 1H), 3.0-3.1 (m, 1H), 1.8-2.0 (m, 6H), 0.88 (s, 9H), 0.02 (s, 3H), -0.16 (s, 3H).

[00155] Example 56. (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonic acid

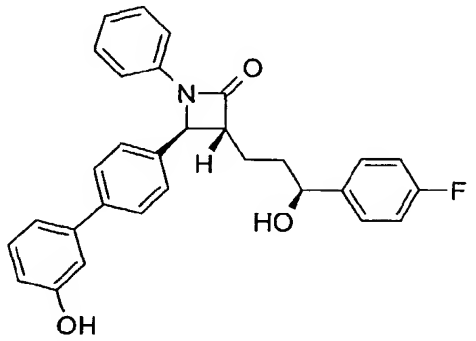


[00156] This reaction was performed using a PersonalChemistry™ microwave instrument set at normal absorbance, fixed hold time and 30 sec pre-stirring. A 10-mL reaction vial was charged with 4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl trifluoromethanesulfonate (0.27 g, 0.38 mmol), dimethyl phosphite (0.070 mL, 0.76 mmol) and triethylamine (0.15 mL, 1.08 mmol) in toluene (4 mL). Nitrogen was bubbled through the stirred solution for 5 min, tetrakis(triphenylphosphine)palladium(0) (0.1 g) was added, and the solution was covered with a blanket of nitrogen and sealed. The reaction mixture was heated for 11 min at 160 °C, then cooled to room temperature and diluted with ethyl acetate. The yellow solution was washed successively with 0.5 M hydrochloric acid (20 mL) water (3x) and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. Pure dimethyl (4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonate was obtained as a white foam (0.26 g, 65%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% ethyl acetate to 100%). ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (dt, J = 14.2, 1.5 Hz, 1H), 7.60 (d, J = 8.5 Hz, 2H), 7.40(d, J = 8.5 Hz, 2H), 6.9-7.8 (m, 12H), 4.68 (t, J = 5.7 Hz, 1H), 4.64 (d, J = 2.4 Hz, 1H), 3.81 (d, J = 0.9 Hz, 1H), 3.77 (d, J = 0.9 Hz, 1H), 3.0-3.1 (m, 1H), 1.8-2.2 (m, 4H), 0.88 (s, 9H), 0.02 (s, 3H), -0.16 (s, 3H) ppm

[00157] A solution of dimethyl (4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-

yl}biphenyl-3-yl)phosphonate (0.32 g, 0.47 mmol) in dry dichloromethane (15 mL) under nitrogen was cooled in an ice bath and bromotrimethylsilane (0.30 mL, 2.27 mmol) was dripped in over 5 min. The reaction mixture was stirred at room temperature for 3 h, then poured into ice water (20 mL) and extracted with ethyl acetate. The organic solution was washed successively with water (2x) and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. The residue was purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 20% to 70% acetonitrile-0.1% trifluoroacetic acid in water) to afford (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonic acid (0.25 g, 99%) as a white powder; ^{1}H NMR (300 MHz, CD_3OD) δ 8.04 (br d, J = 14.2 Hz, 1H) 7.68 (d, J = 8.5 Hz, 2H), 7.50(d, J = 8.5 Hz, 2H), 7.0-7.8 (m, 12H), 4.93 (d, J = 2.2 Hz, 1H), 4.63 (t, J = 5.2 Hz, 1H), 3.1-3.2 (m, 1H), 1.8-2.1 (m, 4H) ppm; MS $[M-H]^-$ 531, $[2M-H]^-$ 1061

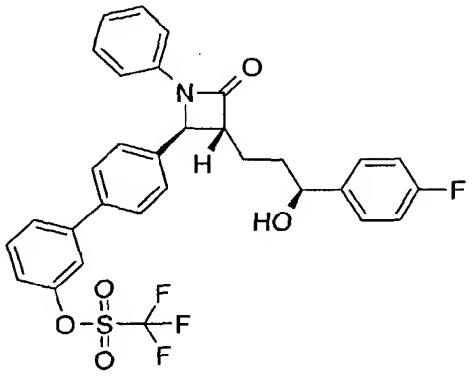
[00158] Example 57. (3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one



(3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one was synthesized in a manner similar to that described in Example 42. (3*R*,4*S*)-4-(3'-{[*tert*-Butyl(dimethyl)silyl]oxy}biphenyl-4-yl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (0.60 g, 0.86 mmol) was stirred at room temperature in acetonitrile (18 mL) in a 40 ml polypropylene vial fitted with a screw cap. Hydrogen fluoride (48% aqueous, 2.0 mL, 48 mmol) was dripped in and stirring was continued at room temperature overnight. The reaction mixture was poured into an aqueous solution of 1 N sodium hydroxide (45 mL) buffered

with 1 M sodium phosphate (45 mL, pH 7.4), then the pH of the solution was brought to pH 8 with the addition of aqueous 10% sodium bicarbonate solution. The mixture was extracted with ethyl acetate and the organic solution was washed successively with 10% sodium bicarbonate solution (2x), water (2x) and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. Pure (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one was obtained as a white foam (0.35 g, 87%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 10% ethyl acetate to 60%) ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.56 (d, J = 8.2, Hz, 2H), 7.39 (d, J = 8.2 Hz, 2H), 7.0-7.3 (m, 12H), 6.80-6.86 (m, 1H), 5.00 (br s, 1H), 4.74 (t, J = 6.2 Hz, 1H), 4.69 (d, J = 2.2 Hz, 1H), 3.1-3.2 (m, 1H), 2.20 (br s, 1H), 1.8-2.1 (m, 4H) ppm; MS $[M+HCO_2^-]^-$ 512

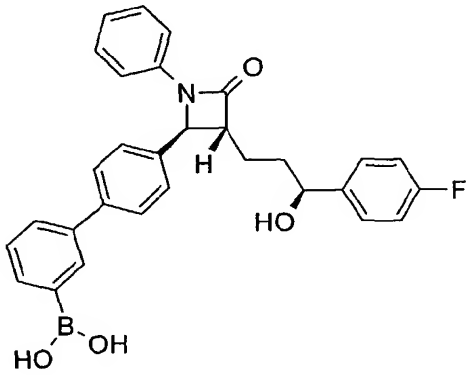
[00159] Example 58. 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl trifluoromethanesulfonate



(3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one (0.353 g, 0.77 mmol) was stirred at room temperature in dry dichloromethane (15 mL) under a nitrogen atmosphere. Phenyltrifluoromethanesulfonimide (0.38 g, 1.69 mmol), triethylamine (0.23 mL, 1.65 mmol) and 4-dimethylaminopyridine (0.02 g, 0.2 mmol) were added in succession and the reaction mixture was stirred 1 h at room temperature. The solution was poured into 0.5 N hydrochloric acid (20 mL) and extracted with ethyl acetate. The organic phase was washed successively with water, 10% aqueous sodium bicarbonate, water and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by

rotary evaporation under reduced pressure. Pure 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl trifluoromethanesulfonate was obtained as a white foam (0.35 g, 76%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% ethyl acetate to 50%); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.0-7.6 (m, 17H), 4.74 (t, J = 6.4 Hz, 1H), 4.72 (d, J = 2.2 Hz, 1H), 3.1-3.2 (m, 1H), 2.16 (br s, 1H), 1.9-2.1 (m, 4H) ppm; MS $[M+HCO_2^-]^-$ 644

[00160] Example 59. (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)boronic acid

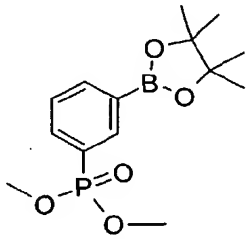


4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl trifluoromethanesulfonate (0.15 g, 0.25 mmol), bis(pinacolato)diboron (0.70 g, 0.27 mmol), potassium acetate (0.80 g, 0.81 mmol) and dichloro[1,1'-bis(diphenylphosphino) ferrocene]palladium(II) (0.020 g, 0.03 mmol) were combined in dimethylsulfoxide (7 mL) in a 40-mL screw-cap vial at room temperature. The mixture was covered with a nitrogen atmosphere, the vial was sealed and the reaction was heated overnight at 80 °C. The reaction mixture was cooled to room temperature, poured into water and extracted with ethyl acetate. The organic phase was washed successively with water (2x) and brine, dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. Pure (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenyl-4-[3'-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)biphenyl-4-yl]azetidin-2-one was obtained as a white foam (0.097 g, 67%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% ethyl acetate to 70%) ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.01(br s, 1H), 7.75-7.85 (m, 1H), 7.0-7.7 (m, 15H), 4.74 (t, J = 6.2 Hz, 1H), 4.69 (d, J = 2.2 Hz, 1H), 3.0-3.2 (m, 1H), 1.50 (br s, 1H), 1.8-2.1 (m, 4H), 1.35 (s,

6H), 1.24 (s, 6H) ppm; MS $[M+HCO_2^-]^-$ 577

[00161] (3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-1-phenyl-4-[3'-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)biphenyl-4-yl]azetidin-2-one (0.020 g, 0.034 mmol) was dissolved in ethanol (3 mL) and water (1 mL) at room temperature. Solid sodium carbonate (0.10 g, 1.2 mmol) was added and the mixture was rapidly stirred 2 h at room temperature. The solution was poured into 0.5 N hydrochloric acid (4 mL) and extracted with ethyl acetate. The organic phase was washed successively with water (2x) and brine, then dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. The residue was purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 40% to 75% acetonitrile-0.1% trifluoroacetic acid in water) to afford (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)boronic acid as a white powder (0.012 g, 70%); ^{1}H NMR (300 MHz, CD_3OD) δ 7.83 (br s, 1H), 7.0-7.7 (m, 16H), 4.92 (d, J = 2.7 Hz, 1H), 4.63 (t, J = 6.2 Hz, 1H), 3.1-3.2 (m, 1H), 1.8-2.1 (m, 4H) ppm; MS $[M+HCO_2^-]^-$ 540

[00162] Example 60. Dimethyl [3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate



3-Chlorophenol (0.50 g, 3.89 mmol) was stirred at room temperature in dry dichloromethane (20 mL) under a nitrogen atmosphere. Phenyltrifluoromethanesulfonimide (1.80 g, 5.0 mmol), triethylamine (0.90 mL, 6.4 mmol) and 4-dimethylaminopyridine (0.10 g, 0.8 mmol) were added in succession and the reaction mixture was stirred 2 h at room temperature. The solution was poured into 0.5 N hydrochloric acid (20 mL) and extracted with ethyl acetate. The organic phase was washed successively with water, 10% aqueous sodium bicarbonate and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. Pure 3-chlorophenyl

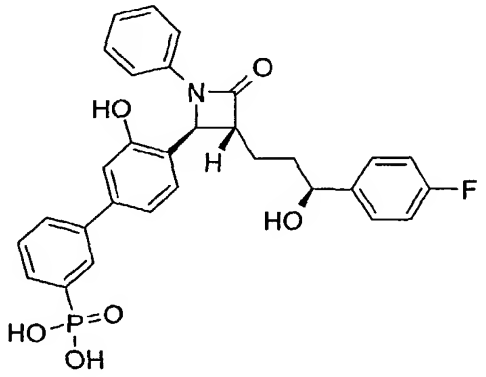
trifluoromethanesulfonate was obtained as a colorless oil (0.92 g, 91%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% to 50% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.16-7.50 (m) ppm

[00163] This reaction was performed using a PersonalChemistry™ microwave instrument set at normal absorbance, fixed hold time and 30 sec pre-stirring. A 10-mL reaction vial was charged with 3-chlorophenyl trifluoromethanesulfonate (0.60 g, 2.30 mmol), dimethyl phosphite (0.42 mL, 4.58 mmol) and triethylamine (0.64 mL, 4.59 mmol) in toluene (4 mL). Nitrogen was bubbled through the stirred solution for 5 min, the tetrakis(triphenylphosphine)palladium(0) (0.1 g) was added, the solution was covered with a blanket of nitrogen and sealed. The reaction mixture was heated 11 min at 160 °C, then cooled to room temperature and diluted with ethyl acetate. The yellow solution washed successively with water (3x) and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. Pure dimethyl (3-chlorophenyl)phosphonate was obtained as a colorless oil (0.27 g, 57%) by chromatography over silica gel using ethyl acetate-hexane (gradient: 5% ethyl acetate to 100%). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (br d, J = 13.7 Hz, 1H), 7.68 (ddt, J = 13.0,7.5, 1.4 Hz, 1H), 7.53 (dquint., J = 8.0, 1.1 Hz, 1H), 7.38-7.45 (m, 1H), 3.79 (s, 3H), 3.75 (s, 3H) ppm; MS $[M+H]^+$ 221, $[2M+H]^+$ 441

[00164] Bis(dibenzylidineacetone)palladium(0) (0.10 g, 0.17 mmol and tricyclohexylphosphine (0.12 g, 0.43 mmol) were stirred 30 min in dry dioxane (1.0 mL) under an atmosphere of nitrogen at room temperature. Dimethyl (3-chlorophenyl)phosphonate (0.50 g, 2.26 mmol), bis(pinacolato)diboron (0.70 g, 0.27 mmol) and potassium acetate (0.30 g, 0.30 mmol) were mixed in dry dioxane (3.0 mL) at room temperature under a nitrogen atmosphere in a separate flask. A portion of the palladium catalyst solution (0.20 mL) was syringed into the flask containing the chlorophosphonate and this mixture was heated at 80 °C. Additional 0.2 mL portions of the catalyst solution were syringed into the reaction mixture after 4 h and 8 h of heating at 80 °C, then heating was continued overnight at 80 °C. The reaction mixture was filtered through Celite® and the solvent was removed by rotary evaporation under reduced pressure. Chromatography over silica gel using ethyl acetate-hexane (gradient: 0% ethyl

acetate to 80%) dimethyl [3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate as a colorless oil (0.41 g). ^{1}H NMR showed a 60:40 mixture of product plus recovered starting material. This mixture was used as is in the next reaction without further purification. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.22 (d, J = 13.2 Hz, 1H), 7.95-8.00 (m, 1H), 7.88 (ddt, J = 13.0,7.5, 1.4 Hz, 1H), 7.43-7.50 (m, 1H), 3.76 (s, 3H), 3.73 (s, 3H) ppm; MS $[M+H]^+$ 312, $[2M+H]^+$ 625

[00165] Example 61. (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid



(3*R*,4*S*)-4-(4-Bromo-2-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (0.080 g, 0.11 mmol), crude dimethyl [3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate (0.054 g total, 0.030 g calculated, 0.096 mmol) and aqueous 2 M potassium carbonate (0.12 mL, 0.24 mmol) were mixed in ethanol (1.0 mL) and toluene (3.0 mL). The solution was deoxygenated by bubbling nitrogen through the mixture for 5 min while stirring. Tetrakis(triphenylphosphine)palladium(0) (0.05 g) was added and the reaction was heated for 3 h at 70 °C under an atmosphere of nitrogen. The reaction was cooled to room temperature, diluted with ethyl acetate, washed with water and brine, dried over sodium sulfate and concentrated by rotary evaporation under reduced pressure. The product was purified by chromatography over silica gel using ethyl acetate-hexane (gradient: 10% ethyl acetate to 80%) to afford dimethyl (3'-{[*tert*-butyl(dimethyl)silyl]oxy}-4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonate as a colorless syrup (0.065 g, 84%). ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.9-8.0 (m, 16H), 5.09 (d,

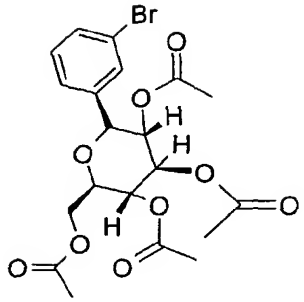
J = 2.2 Hz, 1H), 4.64 (d, *J* = 6.1 Hz, 1H), 3.79 (d, *J* = 2.4 Hz, 3H), 3.76 (d, *J* = 2.4 Hz, 3H), 3.05-3.15 (m, 1H), 1.8-2.0 (m, 4H), 1.06 (s, 9H), 0.85 (s, 9H), 0.36 (s, 3H), 0.33 (s, 3H), 0.00 (s, 3H), -0.20 (s, 3H) ppm

[00166] Dimethyl (3'-{[*tert*-butyl(dimethyl)silyl]oxy}-4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonate (0.047 g, 0.058 mmol) was stirred at room temperature in dry methanol (2 mL) under a nitrogen atmosphere. Potassium fluoride (0.02 g, 0.34 mmol) was added and the reaction mixture was stirred for 30 min at room temperature. The solution was poured into ethyl acetate and washed successively with water (2x), and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. Dimethyl (4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonate was obtained as a colorless glass (0.041 g, 100%) was used directly in the next reaction without further purification; MS $[M-H]^+$ 688

[00167] A solution of dimethyl (4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonate (0.041 g, 0.059 mmol) in dry dichloromethane (5 mL) under nitrogen was cooled in ice and bromotrimethylsilane (0.030 mL, 0.30 mmol) was dripped in over 5 min. The reaction mixture was stirred at room temperature for 3 h, then methanol (1 mL) was added and the reaction was partitioned between water and ethyl acetate. The organic solution was washed successively with water (2x) and brine. The organic solution was dried over sodium sulfate, filtered and the solvent was removed by rotary evaporation under reduced pressure. The residue was purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 59% acetonitrile-0.1% trifluoroacetic acid in water) to afford (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid as a white powder (0.014 g, 44%); ^{1}H NMR (300 MHz, CD_3OD) δ 8.0 (d, *J* = 13.6 Hz, 1H), 6.9-7.8 (m, 15H), 5.17 (d, *J* = 2.1 Hz, 1H), 4.63 (d, *J* = 5.2 Hz, 1H), 3.15-3.25 (m, 1H), 1.8-2.1 (m, 4H) ppm; MS $[M-H]^+$ 546, $[2M-H]^+$ 1093

[00168] Example 62. (1*S*)-2,3,4,6-Tetra-*O*-acetyl-1,5-anhydro-1-(3-bromophenyl)-D-

glucitol



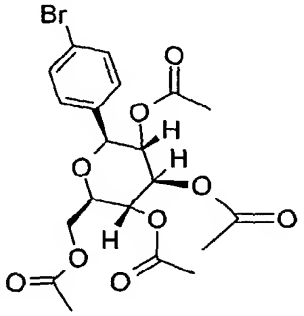
D-Glucopyranose (1.0 g, 5.55 mmol) was dissolved in 5 mL of acetic anhydride and 7 mL of pyridine at 0 °C. To this mixture was added 4-dimethylaminopyridine (200 mg, 1.63 mmol), and the reaction was stirred while warming to room temperature. TLC (40% ethyl acetate-hexane) after 18 h showed complete consumption of the starting material and formation of a higher running spot. The reaction was poured into 50 mL of water and extracted into dichloromethane (3 x 50 mL). The organic layers were combine, washed with 1 N hydrochloric acid (3 x 20 mL), dried over sodium sulfate, filtered, concentrated and purified by column chromatography (50 g silica gel, 40% ethyl acetate-hexane) to afford 1,2,3,4,6-penta-*O*-acetyl-α-D-glucopyranose (2.10 g, 5.37 mmol).

[00169] 1,2,3,4,6-penta-*O*-acetyl-α-D-glucopyranose (1.0 g, 2.60 mmol) was dissolved in 20 mL of dichloromethane and 1.90 mL of hydrobromic acid (33% in acetic acid) at 0 °C, and the reaction was stirred while warming to room temperature. TLC (40% ethyl acetate-hexane) after 18 h showed complete consumption of the starting material and formation of a higher running spot. The reaction was slowly diluted with saturated sodium bicarbonate (25 mL), extracted into dichloromethane (2 x 100 mL), dried over sodium sulfate, filtered and concentrated to afford 2,3,4,6-tetra-*O*-acetyl-α-D-glucopyranosyl bromide which was used without purification.

[00170] Magnesium (0) (400 mg) was suspended in 17 mL of anhydrous diethyl ether, and to the suspension was added 100 µL of 1,2-dibromoethane. 1,3-dibromobenzene (3.8 g, 16.08 mmol) was added at a rate to keep a moderate reflux. After Grignard formation was complete (magnesium consumed and the reaction cooled), 2,3,4,6-tetra-*O*-acetyl-α-D-glucopyranosyl bromide (0.34 g, 0.80 mmol in 8mL of anhydrous diethyl ether) was

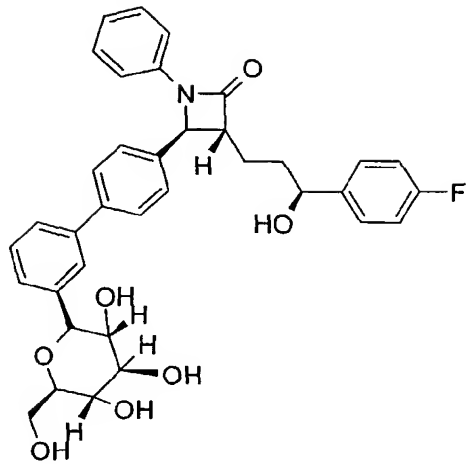
added drop-wise. The reaction was refluxed for 5 h, cooled to room temperature and poured into a separatory funnel with 20 mL of water. The flask was rinsed with 50 mL of diethyl ether and 3 mL of acetic acid (to dissolve the magnesium salts) and added to the seperatory funnel. The layers were separated and the aqueous layer was collected and concentrated in vacuo. The white pasty solid was dissolved in 15 mL of pyridine and 10 mL of acetic anhydride. After 20 h at room temperate the reaction was poured into 150 mL of water and extracted into dichloromethane (3 x 150 mL). The organic layers were combine, washed with 1 N hydrochloric acid (3 x 50 mL), dried over sodium sulfate, filtered, concentrated and purified by column chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane) to afford (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(3-bromophenyl)-D-glucitol (0.178 g, 0.36 mmol, 45% yield) as a white foam; R_f 0.4 (40% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.44 (m, 2H) 7.25 (m, 2H), 5.27-5.35 (m, 1H), 5.21 (t, J = 9.6 Hz, 1H), 5.03 (t, J = 9.7 Hz, 1H), 4.36 (d, J = 9.9 Hz, 1H), 4.23-4.32 (m, 1H) 4.08-4.18 (m, 1H) 3.80-3.85 (m, 1H) 2.09 (s, 3H), 2.06 (s, 3H), 1.99 (s, 3H), 1.84 (s, 3H) ppm; MS $[M+H]^+$ 488.4

[00171] Example 63. Synthesized in the same manner as Example 62, but replacing 1,3 dibromobenzene with 1,4 dibromobenzene



(1*S*)-2,3,4,6-Tetra-*O*-acetyl-1,5-anhydro-1-(4-bromophenyl)-D-glucitol was obtained (45% yield, white wax). R_f 0.3 (40% ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.47 (d, J = 8.4 Hz, 2H), 7.31 (d, J = 8.7, 2H), 5.31 (d, J = 9.3 Hz, 1H), 5.21 (t, J = 9.9 Hz, 1H), 5.09 (t, J = 9.6 Hz, 1H), 4.37 (d, J = 9.9 Hz, 1H), 4.12-4.33 (m, 2H), 3.83 (m, 1H), 2.09 (s, 3H), 2.06 (s, 3H), 2.00 (s, 3H), 1.83 (s, 3H) ppm; MS $[M+H]^+$ 488.4

[00172] Example 64. (1*S*)-1,5-Anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol

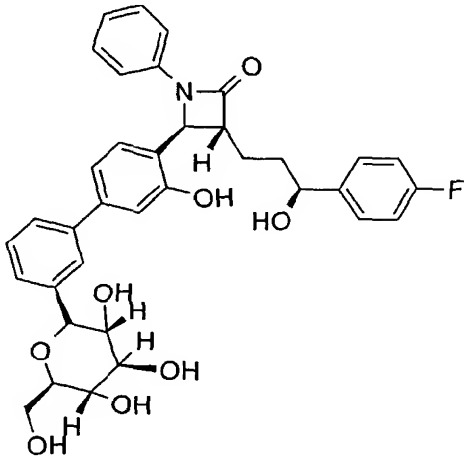


(3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-1-phenyl-4-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]azetidin-2-one (51.3 mg, 0.102 mmol) and (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(3-bromophenyl)-D-glucitol (35.5 mg, 0.073 mmol) were dissolved in 2.0 mL of toluene and 0.25 mL of ethanol. 0.075 mL of 4 N potassium carbonate was added to the mixture followed by 5.0 mg of tetrakis(triphenylphosphine)palladium(0). The entire reaction was degassed three times with argon then heated to reflux for 4 h. The reaction was cooled to room temperature, diluted with 5 mL of water , and extracted with ethyl acetate (3 x 25 mL). The organic layers were combine, dried over sodium sulfate, filtered, concentrated and purified by column chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane) to afford 10.5 mg (13%) of (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol as a clear oil.

[00173] (1*S*)-2,3,4,6-Tetra-*O*-acetyl-1,5-anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol (10.5 mg, 0.013 mmol) was dissolved in 0.30 mL of methanol and 0.30 mL of triethylamine followed by drop-wise addition of water (0.80 mL). The yellowish mixture stirred at room temperature overnight. LCMS of the solution confirmed complete consumption of the starting material and formation of the fully deprotected material. The mixture was concentrated *in vacuo*, and purified by reverse-phase HPLC (Polaris C18-A

10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) to afford 2.8 mg (35%) of the desired (1*S*)-1,5-anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol as a white powder; ^{1}H NMR (300 MHz, CD_3OD) δ 7.65 (d, J = 11.1 Hz, 2H), 7.54-7.23 (m, 10H), 7.05-6.89 (m, 3H), 4.61 (t, J = 6.3 Hz, 1H), 4.19 (d, J = 9.0 Hz, 1H), 3.87 (d, J = 10.7 Hz, 1H), 3.73 –3.63 (m, 1H), 3.49-3.36 (m, 3H) 3.22-3.18 (m, 2H), 1.89 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 596.5

[00174] Example 65. (1*S*)-1,5-Anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol



(3*R*,4*S*)-4-(4-Bromo-2-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-1-phenylazetidin-2-one (0.42 g, 0.60 mmol) was dissolved in 15mL of dioxane in a sealed tube. Bis(pinacolato)diboron (0.17 g, 0.66 mmol), potassium acetate (0.18g, 1.83 mmol), and dichloro[1,1'-bis(diphenylphosphino)ferrocene] palladium(II) dichloromethane adduct (14.6 mg, 0.018 mmol) were added and the reaction was degassed with argon and heated to 85 °C for 24 h. The mixture was cooled to room temperature diluted with 50 mL of 1:1 ethyl acetate-hexane, washed with 100 mL of 0.1 N hydrochloric acid and 2 x 100 mL of brine. The organic layers were collected, partially concentrated to half the volume, filtered through 10 g of silica gel, washed with 50 mL of ethyl acetate and concentrated *in vacuo*.

[00175] The resulting brown oil which is (3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-

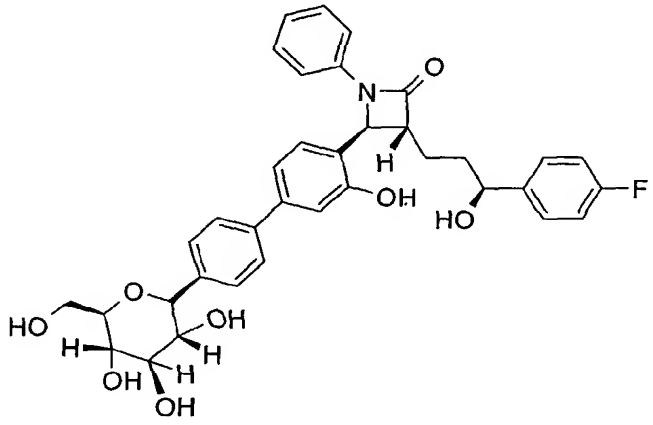
butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-[2-{[*tert*-butyl(dimethyl)silyl]oxy}-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]-1-phenylazetidin-2-one was dissolved with (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(3-bromophenyl)-D-glucitol in 4.0 mL of toluene and 0.5 mL of ethanol. 0.150 mL of 4 N potassium carbonate was added followed by 7 mg of tetrakis(triphenylphosphine)palladium(0). The entire reaction was degassed three times with argon then heated to reflux for 1.5 h. After this time the reaction was cooled to room temperature and diluted with 25 mL of water and extracted with 1:1 hexane-ethyl acetate (3 x 75 mL). The organic layers were combine, dried over sodium sulfate, filtered, concentrated and purified by column chromatography (12 g silica gel, 5% to 95% ethyl acetate-hexane) to afford 41.6 mg (27%) of (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(3'-{[*tert* butyl(dimethyl)silyl]oxy}-4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol as a clear oil.

[00176] This material was immediately dissolved in 0.80 mL of methanol and 0.80 mL of triethylamine followed by dropwise addition of water (2.3 mL). The yellow mixture was stirred at room temperature for 24 h, extracted with 1:1 ethyl acetate-hexane (3 x 100 mL), dried with sodium sulfate, and concentrated *in vacuo* to afford (1*S*)-1,5-anhydro-1-(3'-{[*tert*-butyl(dimethyl)silyl]oxy}-4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol.

[00177] The final deprotection was accomplished by dissolving (1*S*)-1,5-anhydro-1-(3'-{[*tert*-butyl(dimethyl)silyl]oxy}-4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-yl)-D-glucitol in 5 mL of acetonitrile, and adding 2.5 mL of 48% hydrofluoric acid. The mixture stirred at room temperature of 1.5 h, neutralized with 70 mL of 1 N sodium hydroxide and 50 mL of 1 M sodium phosphate buffer pH 7.4, extracted into ethyl acetate (2 x 100 mL), washed with saturated sodium bicarbonate (2 x 25 mL), dried with sodium sulfate, filtered and concentrated *in vacuo*. The crude sample was purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to

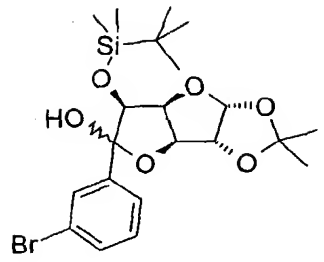
95% acetonitrile-0.1% trifluoroacetic acid in water) to afford 7.9 mg (74%) of the desired (1*S*)-1,5-anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol as a white solid; ^{1}H NMR (300 MHz, CD_3OD) δ 7.49 (dd, J = 6.6 Hz, 4H), 7.34-7.21 (m, 7H), 7.15 (d, J = 7.8 Hz, 1H), 7.07-6.97 (m, 5H), 5.13 (d, J = 2.1 Hz, 1H), 4.61 (m, 1H), 4.15 (d, J = 9.3 Hz, 1H) 3.90 (d, J = 12 Hz, 1H), 3.70 (m, 1H) 3.41 (m, 4H), 3.16 (m, 1H), 1.99-1.93 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 612.6

[00178] Example 66. (1*S*)-1,5-Anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol



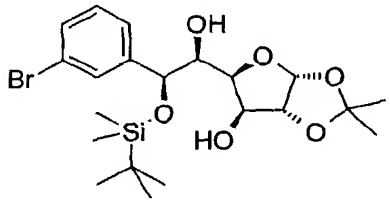
Obtained in a manner similar to Example 65, but using (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(4-bromophenyl)-D-glucitol in place of (1*S*)-2,3,4,6-tetra-*O*-acetyl-1,5-anhydro-1-(3-bromophenyl)-D-glucitol. (1*S*)-1,5-Anhydro-1-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol (20 % yield, white solid). ^{1}H NMR (300 MHz, CD_3OD) δ 7.49 (dd, J = 8.1 Hz, 4H), 7.35-7.16 (m, 8H), 7.05-6.97 (m, 4H), 5.15 (d, J = 1.8 Hz, 1H), 4.61 (m, 1H), 4.16 (d, J = 9.6 Hz, 1H), 3.90 (d, J = 11.1 Hz, 1H), 3.71 (m, 1H), 3.42 (m, 4H), 3.16 (m, 1H), 2.02-1.93 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 612.6

[00179] Example 67. (2*S*/2*R*,3*S*,4*S*,6*R*,7*R*,8*S*)-3-*O*-*tert*-Butyldimethylsilyl-2,3,6,7-tetrahydroxy-6,7-*O*-isopropylidene-1,5-dioxa-2-(3-bromophenyl)-bicyclo[3.3.0]octane



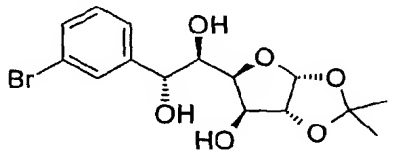
n-Butyllithium (31.5 mL, 41.0 mmol, 1.3 M hexane) was added via addition funnel to 1,3-dibromobenzene (9.64 g, 41.0 mmol, 4.94 mL) dissolved in anhydrous tetrahydrofuran (30 mL) at –78 °C over 30 min. The addition funnel was rinsed with anhydrous tetrahydrofuran (15 mL) and the reaction was allowed to stir for 30 min at –78 °C. To this solution was added 5-*O*-*tert*-butyldimethylsilyl-1,2-*O*-isopropylidene-α-D-glucuronolactone (4.5 g, 13.6 mmol) [prepared according to *Tetrahedron Asymmetry* 7:9, 2761, (1996)] dissolved in 30 mL of anhydrous tetrahydrofuran at –78 °C and the reaction stirred for 2 h. The reaction was quenched by the addition of saturated ammonium chloride (20 mL) followed by warming to room temperature. The reaction was poured into ethyl acetate (30 mL) and water (10 mL) and the layers separated. The aqueous layer was extracted with ethyl acetate (2 x 20 mL). The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated and purified by chromatography (1:1 diethyl ether-hexane) to afford a diastereomeric mixture of (2*S*/2*R*,3*S*,4*S*,6*R*,7*R*,8*S*)-3-*O*-*tert*-butyldimethylsilyl-2,3,6,7-tetrahydroxy-6,7-*O*-isopropylidene-1,5-dioxa-2-(3-bromophenyl)-bicyclo[3.3.0]octane (4.77 g, 72% yield) as a colorless viscous oil. R_f 0.51 (3:1 hexane-ethyl acetate)

[00180] Example 68. (6*S*)-6-*C*-(3-Bromophenyl)-6-*O*-[*tert*-butyl(dimethyl)silyl]-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose



[00181] Sodium borohydride (11.1 mg, 0.29 mmol) was added to (2*S*/2*R*,3*S*,4*S*,6*R*,7*R*,8*S*)-3-*O*-*tert*-butyldimethylsilyl-2,3,6,7-tetrahydroxy-6,7-*O*-isopropylidene-1,5-dioxa-2-(3-bromophenyl)-bicyclo[3.3.0]octane dissolved in absolute ethanol (4 mL) at room temperature. The reaction was stirred at room temperature for 1 h. TLC analysis (3:1 hexane-ethyl acetate) indicated that all the starting lactol had been consumed. 1 mL of saturated ammonium chloride solution was added and the reaction was stirred until the effervescence ceased. The reaction was poured into ethyl acetate (30 mL) and water (10 mL) and the layers separated. The aqueous layer was extracted 2 x 20 mL with ethyl acetate. The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated and purified by chromatography (3:1 hexane:ethyl acetate) to afford (6*S*)-6-*C*-(3-bromophenyl)-6-*O*-[*tert*-butyl(dimethyl)silyl]-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (125 mg, 88% yield) as a white waxy solid. mp 76-77 °C; R_f 0.24 (3:1 hexane:ethyl acetate); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.51-7.17 (m, 4H), 5.95 (d, J = 3.6 Hz, 1H), 4.90 (s, 1H), 4.53 (d, J = 3.9 Hz, 1H), 4.32 (d, J = 2.7 Hz, 1H), 4.09 (dd, J = 2.7 Hz, J = 8.4 Hz, 1H), 3.75 (d, J = 7.2 Hz, 1H), 2.76-2.68 (br s, 2H), 1.46 (s, 3H), 1.31 (s, 3H), 0.92 (s, 9H), 0.11 (s, 3H), -0.10 (s, 3H) ppm

[00182] Example 69. (6*R*)-6-*C*-(3-Bromophenyl)-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose

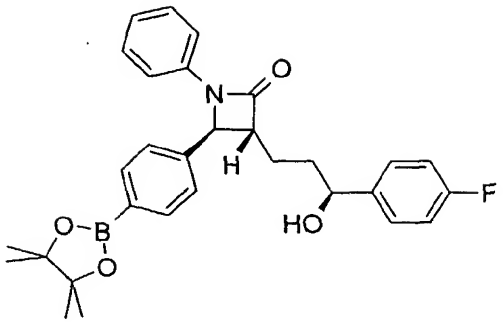


[00183] Tetrabutylammonium fluoride (1 M in tetrahydrofuran, 3.14 mL) was added dropwise to (2*S*/2*R*,3*S*,4*S*,6*R*,7*R*,8*S*)-3-*O*-*tert*-butyldimethylsilyl-2,3,6,7-tetrahydroxy-6,7-*O*-isopropylidene-1,5-dioxa-2-(3-bromophenyl)-bicyclo[3.3.0]octane (1.53 g, 3.14 mmol) and glacial acetic acid (188.4 mg, 3.14 mmol, 180 μL) in anhydrous tetrahydrofuran (30 mL) at 0 °C. The reaction was stirred for 30 min at 0 °C then warmed to room temperature and stirred an additional 30 min. TLC analysis (3:1 hexane-ethyl acetate) indicated that the starting material had been completely consumed. The reaction was

poured into ethyl acetate (30 mL), washed with saturated sodium bicarbonate (10 mL) and brine (2 x 10 mL). The aqueous layer was back extracted with ethyl acetate (2 x 20 mL). The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated and purified by chromatography (35 g, 40% ethyl acetate-hexane isocratic) to afford (2*S*/2*R*,3*S*,4*S*,6*R*,7*R*,8*S*)-2,3,6,7-tetrahydroxy-6,7-*O*-isopropylidene-1,5-oxa-2-(3-bromophenyl)-bicyclo[3.3.0]octane (1.146 g, 98% yield) as a white solid; R_f 0.18 (3:1 hexane-ethyl acetate)

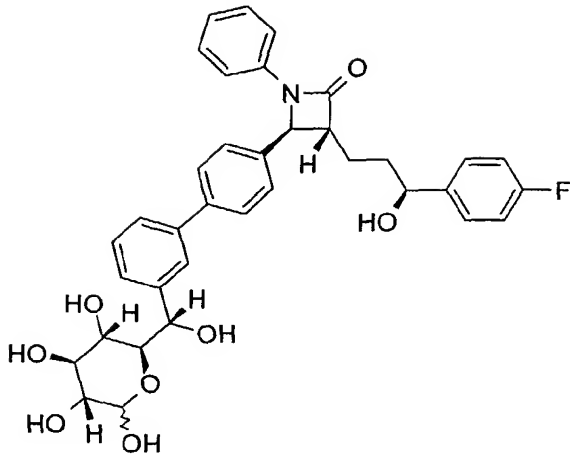
[00184] Sodium borohydride (116 mg, 3.1 mmol) was added to (2*S*/2*R*,3*S*,4*S*,6*R*,7*R*,8*S*)-2,3,6,7-tetrahydroxy-6,7-*O*-isopropylidene-1,5-oxa-2-(3-bromophenyl)-bicyclo[3.3.0]octane (1.15 g, 3.1 mmol) dissolved in absolute ethanol (5 mL) at room temperature. The reaction was stirred at room temperature for 1 h. TLC analysis (2:1 ethyl acetate-hexane) indicated that all the starting lactol had been consumed. 1 mL of saturated ammonium chloride solution was added and the reaction stirred until the effervescence ceased. The reaction was poured into ethyl acetate (30 mL) and water (10 mL) and the layers separated. The aqueous layer was extracted with ethyl acetate (2 x 20 mL). The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated and purified by chromatography (2:1 ethyl acetate-hexane to elute the first diastereomer then 100% ethyl acetate) to afford (6*R*)-6-*C*-(3-bromophenyl)-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (511 mg, 89% yield) as a white solid; mp 172-173 °C; R_f 0.19 (2:1 ethyl acetate-hexane); ^{1}H NMR (300 MHz, $CDCl_3/CD_3OD$) δ 7.62-7.61 (m, 1H), 7.42-7.38 (m, 1H), 7.21 (t, J = 7.5 Hz, 1H), 5.94 (d, J = 3.9 Hz, 1H), 4.86 (d, J = 4.5 Hz, 1H), 4.48 (d, J = 3.3 Hz, 1H), 4.24 (d, J = 2.4 Hz, 1H), 4.14-4.10 (m, 1H), 3.79-3.74 (m, 1H), 1.38 (s, 3H), 1.30 (s, 3H) ppm

[00185] Example 70. (3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-1-phenyl-4-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]azetidin-2-one



(3*R*,4*S*)-4-(4-Bromophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one (45.1 mg, 0.10 mmol), bis(pinacolato)diboron (27.7 mg, 0.11 mmol), dichloro[1,1'-bis(diphenylphosphino)ferrocene]palladium(II) dichloromethane adduct (2.4 mg, 0.003 mmol), and potassium acetate (29.7 mg, 0.30 mmol) were dissolved in anhydrous dimethyl sulfoxide (600 μL). The vessel was evacuated and flushed with argon three times then sealed and heated at 80 °C for 16 h. LCMS analysis indicated that some starting material remained so an additional aliquot of catalyst and bis(pinacolato)diboron were added, the solution degassed and heating continued for 2 h. The reaction was diluted into dichloromethane (30 mL) and filtered through a plug of Celite®. The filtrate was washed 2 x 10 mL with water. The combined aqueous washed were back extracted with 3 x 10 mL dichloromethane. The combined organic phase was dried over anhydrous sodium sulfate, filtered and concentrated *in vacuo*. The product was purified by chromatography (12 g silica gel, 20-50% ethyl acetate-hexane) to afford (3*R*,4*S*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenyl-4-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]azetidin-2-one (41.9 mg, 85% yield) as a tan foam; R_f (1:1 hexane-ethyl acetate); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.81 (d, J = 8.1 Hz, 1H), 7.35-7.18 (m, 9 H), 7.04-6.97 (m, 3H), 4.70 (t, J = 5.7 Hz, 1H), 4.65 (d, J = 2.1 Hz, 1H), 3.08 (dt, J = 7.7, 2.5, 1H), 2.02-1.87 (m, 4H), 1.33 (s, 12H) ppm

[00186] Example 71. (6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose

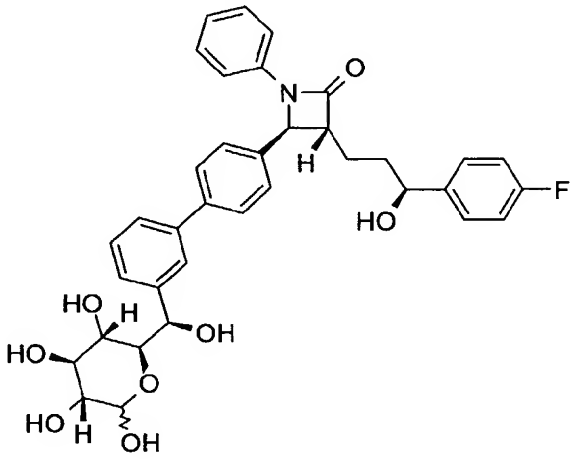


(3*R*,4*S*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-1-phenyl-4-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]azetidin-2-one (26.8 mg, 0.05 mmol), (6*S*)-6-*C*-(3-bromophenyl)-6-*O*-[*tert*-butyl(dimethyl)silyl]-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (18.1 mg, 0.04 mmol), and potassium carbonate (40 μL, 4 N aqueous) were dissolved in 1:1 toluene:ethanol (1 mL total volume). The solution was degassed by evacuating the vessel and flushing with argon three times. Tetrakis(triphenylphosphine)palladium(0) (2.2 mg, 0.002 mmol) was added and the solution was degassed twice. The reaction was heated at 85 °C for 1 h. LCMS and TLC (1:1 hexane-ethyl acetate) analysis indicated consumption of the starting glycoside. The reaction was diluted into ethyl acetate (30 mL) and washed with water (2 x 10 mL). The combined aqueous washes were back extracted with ethyl acetate (2 x 10 mL). The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by chromatography (12 g silica gel, 20-50% ethyl acetate-hexane) to afford (6*S*)-6-*O*-[*tert*-butyl(dimethyl)silyl]-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (13.5 mg, 45% yield) as a white foam; R_f 0.23 (1:1 hexane-ethyl acetate); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.58-7.22 (m, 13H), 7.07-6.98 (m, 4H), 5.97 (d, J = 3.9 Hz, 1H), 4.98 (d, J = 2.4 Hz, 1H), 4.73 (t, J = 6.3 Hz, 1H), 4.69 (d, J = 2.1 Hz, 1H), 4.54 (d, J = 3.9 Hz, 1H), 4.37 (d, J = 2.4 Hz, 1H), 3.87-3.86 (m, 1H), 3.13-3.09 (m, 1H), 2.04-1.86 (m, 4H), 1.43 (s, 3H), 1.31 (s, 3H), 0.94 (s, 9H), 0.12 (s, 3H), -

0.09 (s, 3H) ppm

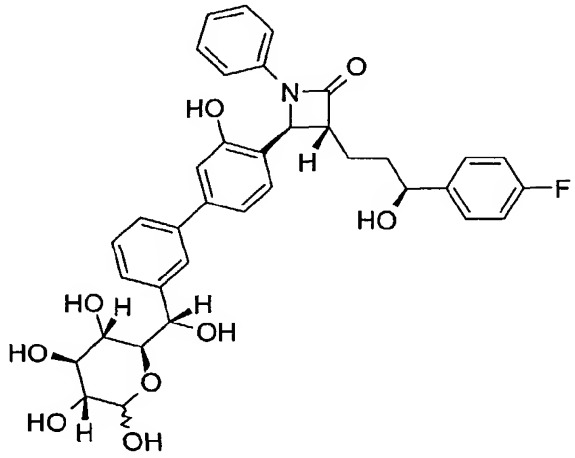
[00187] (6*S*)-6-*O*-[*tert*-Butyl(dimethyl)silyl]-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (13.5 mg, 0.017 mmol) was dissolved in acetonitrile (5 mL) in a polypropylene centrifuge tube. 48% Hydrofluoric acid (500 μL) was added at room temperature and the reaction was stirred for 16 h monitoring by LCMS. Upon completion, 1 equivalent of solid sodium carbonate (1.27 g, 12 mmol) was added and just enough water to dissolve the solid. The reaction was diluted into ethyl acetate (20 mL) and the layers separated. The aqueous solution was extracted with ethyl acetate (3 x 10 mL). The combined organic extracts were washed with saturated sodium carbonate (2 x 10 mL), dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) to afford (6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose (5.5 mg, 51%); ^{1}H NMR (300 MHz, $CDCl_3/CD_3OD$) δ 7.64-7.58 (m, 2H), 7.48-7.21 (m, 12H), 7.08-6.98 (m, 3H), 5.12-5.07 (m, 1.4H), 4.73 (d, J = 2.4 Hz, 1H), 4.66 (t, J = 5.7 Hz, 1H), 4.39 (d, J = 7.5 Hz, 0.6H), 4.00 (dd, *J* = 1.5 Hz, *J* = 9.6 Hz, 0.6H), 3.76-3.56 (m), 3.23-3.10 (m, 1.5H), 2.01-1.90 (m, 4H) ppm; MS $[M+H]^+$ 630.0

[00188] Example 72. (6*R*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose



[00189] Obtained in a manner similar to Example 71 but using as starting materials the products from Examples 68 and 70. (6*R*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose (2.4 mg, 53% yield); ^{1}H NMR (300 MHz, $CDCl_3$/ 0.1% CD_3OD) δ 7.64-7.58 (m, 2H), 7.49-7.23 (m, 12H), 7.08-6.98 (m, 3H), 5.06 (d, J = 3.6 Hz, 0.6H), 4.91 (d, J = 6.0 Hz, 1H), 4.72 (d, J = 4.8 Hz, 1H), 4.66 (t, J = 5.4 Hz, 1H), 4.42 (d, J = 7.8 Hz, 0.4H), 4.07-4.02 (m, 1H), 3.69-3.66 (m, 1H), 3.16-3.11 (m, 1H), 1.96-1.91 (m, 4H) ppm; MS $[M+H]^+$ 630.0

[00190] Example 73. (6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose

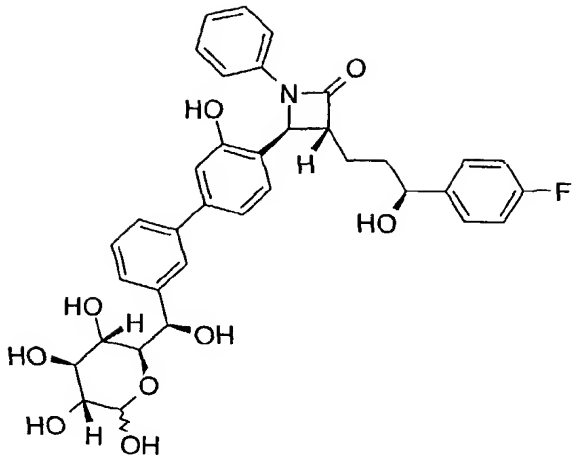


(3*R*,4*S*)-3-[(3*S*)-3-{[*tert*-Butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-[2-{[*tert*-butyl(dimethyl)silyl]oxy}-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]-1-phenylazetidin-2-one (53.0 mg, 0.07 mmol), (6*S*)-6-*C*-(3-bromophenyl)-6-*O*-[*tert*-butyl(dimethyl)silyl]-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (24.1 mg, 0.05 mmol), and potassium carbonate (50 μL, 4 N aqueous solution) were dissolved in 1:1 toluene:ethanol (1 mL total volume). The solution was degassed by evacuating the vessel and flushing with argon three times. Tetrakis(triphenylphosphine)palladium (4.0 mg, 0.003 mmol) was added and the solution degassed twice. The reaction was heated at 85 °C for 1 h. LCMS and TLC (1:1 hexane-ethyl acetate) analysis indicated consumption of

the starting glycoside. The reaction was diluted into ethyl acetate (30 mL) and washed with water (2 x 10 mL). The combined aqueous washes were back extracted with ethyl acetate (2 x 10 mL). The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo*, and purified by chromatography (12 g silica gel, 5-50% ethyl acetate-hexane) to afford (6*S*)-6-*O*-[*tert*-butyl(dimethyl)silyl]-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose (10.5 mg, 20% yield) as a white foam; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.44-7.18 (m, 13H), 7.05-6.93 (m, 3H), 5.97 (d, J = 3.9 Hz, 1H), 5.03 (d, J = 2.1 Hz, 1H), 4.95 (d, J = 2.4 Hz, 1H), 4.67 (m, 1H), 4.56 (t, J = 4.8 Hz, 1H), 4.38 (m, 1H), 4.10 (dd, J = 7.6, 3.0Hz, 1H), 3.87 (m, 1H), 3.12 (m, 1H),1.94-1.89 (m, 4H), 1.44 (s, 3H), 1.31 (s, 3H), 0.93 (s, 9H), 0.86 (s, 9H), 0.11 (s, 3H), 0.01 (s, 3H), -0.11 (s, 3H), -0.16 (s, 3H) ppm

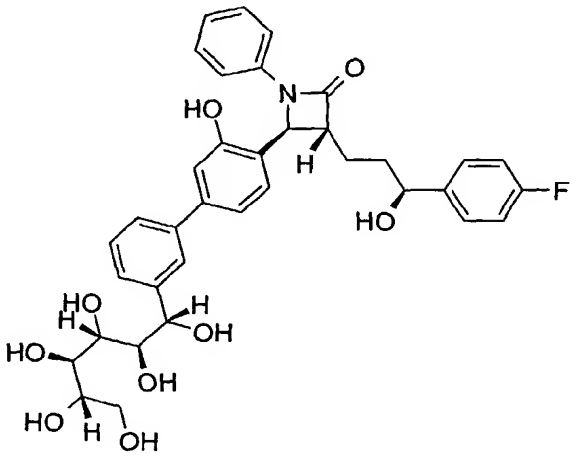
[00191] (6*S*)-6-*O*-[*tert*-Butyl(dimethyl)silyl]-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-1,2-*O*-(1-methylethylidene)-α-D-glucofuranose was dissolved in acetonitrile (5 mL) in a polypropylene centrifuge tube. 48% Hydrofluoric acid (750 µL) was added at room temperature and the reaction stirred for 16 h monitoring progress by LCMS. Upon completion, 1 equivalent of solid sodium carbonate (1.91 g, 18 mmol) was added and just enough water to dissolve the solid. The reaction was diluted into ethyl acetate (20 mL) and the layers separated. The aqueous solution was extracted with ethyl acetate (3 x 10 mL). The combined organic extracts were washed with saturated sodium carbonate (2 x 10 mL), dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by reverse-phase HPLC (Polaris C18-A 10µ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) to afford (6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose (17.8 mg); ^{1}H NMR (300 MHz, $CDCl_3/CD_3OD$) δ 7.52-6.83 (m, 16H), 5.05-5.00 (m, 2H), 4.50 (m, 1H), 4.34 (m, 1H), 3.94 (m, 1H), 3.72-3.59 (m, 2H), 2.91 (m, 1H), 1.95-1.77 (m, 4H) ppm; MS $[M-OH]^+$ 627.8

[00192] Example 74. (6*R*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose



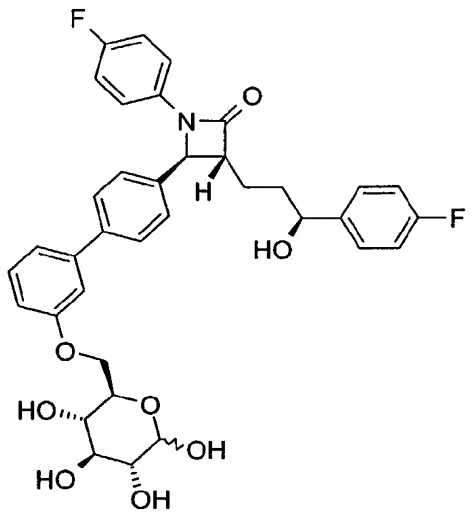
[00193] Obtained in a manner similar to Example 73. Purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) to afford (6*R*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose (4.1 mg, 70% yield); ^{1}H NMR (300 MHz, $CDCl_3/CD_3OD$) δ 7.55-6.90 (m, 16H), 5.08-2.06 (m, 1H), 5.01-5.00 (m, 1H), 4.86 (d, J = 4.5 Hz, 1H), 4.60 (t, J = 5.1 Hz, 1H), 4.39 (d, J = 8.1 Hz, 1H), 4.02-3.97 (m, 1H), 3.70-3.64 (m, 1H), 3.52-3.49 (m, 1H), 1.96-1.85 (m, 4H) ppm; MS $[M-OH]^+$ 627.8

[00194] Example 75. (6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol



(6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose (7.1 mg, 0.01 mmol) was dissolved in 80:20 acetonitrile-water (1 mL). Sodium borohydride (0.4 mg, 0.01 mmol) was added at room temperature and the reaction was stirred for 30 min monitoring by LCMS. Upon completion, the reaction was diluted with 80:20 acetonitrile:water (3 mL) then filtered through a Whatman 0.45 μM glass microfiber filter and purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) to afford (6*S*)-6-*C*-(4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol (1.4 mg, 22% yield). ^{1}H NMR (300 MHz, $CDCl_3/CD_3OD$) δ 7.37-6.89 (m, 16H), 5.08 (d, J = 2.4 Hz, 1H), 4.97-4.95 (m, 1H), 4.60 (t, J = 6.0 Hz, 1H), 3.92 (m, 1H), 3.76-3.56 (m, 6H), 2.01-1.82 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 629.8

[00195] Example 76. 6-*O*-(4'-{(2*S*,3*R*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose



Diethylazodicarboxylate (192.4 mg, 1.11 mmol, 172 μL) was added drop-wise at 0 °C to 1,2,3,4-tetra-*O*-acetyl-β-D-glucopyranose (350.0 mg, 1.01 mmol), 3-bromophenol (174.0 mg, 1.11 mmol), and triphenylphosphine (115.0 mg, 0.44 mmol) dissolved in dry tetrahydrofuran (2 mL). The reaction was stirred for 16 h warming to room temperature. The reaction was diluted into diethyl ether (30 mL) and washed with 5% sodium bisulfate

(2 x 10 mL). The separated organic solution was dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by chromatography (20% ethyl acetate-dichloromethane) to afford 1,2,3,4-tetra-*O*-acetyl-6-*O*-(3-bromophenyl)-β-D-glucopyranose (357 mg, 71% yield)

[00196] Triethylamine (1 mL) was added at room temperature to 1,2,3,4-tetra-*O*-acetyl-6-*O*-(3-bromophenyl)-β-D-glucopyranose (200 mg, 0.40 mmol) dissolved in 5:1methanol-water (6 mL). The reaction progress was monitored by LCMS and TLC (20% ethyl acetate-dichloromethane). Upon completion, the solvents were removed *in vacuo* to afford 6-*O*-(3-bromophenyl)-β-D-glucopyranose which was carried on without further purification.

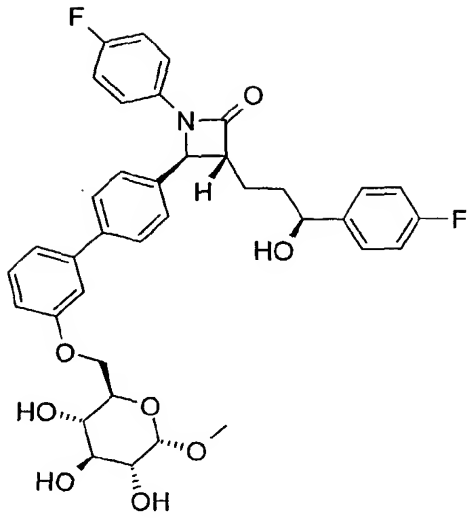
[00197] *tert*-Butyldimethylsilyl trifluoromethanesulfonate (442 mg, 1.67 mmol, 383 μL) was added dropwise at 0 °C to 6-*O*-(3-bromophenyl)-β-D-glucopyranose and 4-dimethylaminopyridine (219 mg, 1.79 mmol) dissolved in dichloromethane (3 mL). The reaction was stirred for 16 h warming to room temperature. The reaction was diluted into dichloromethane (30 mL) and washed with 5% sodium bisulfate (2 x 10 mL). The separated organic solution was dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by chromatography (50% ethyl acetate:hexane) to afford a 6-*O*-(3-bromophenyl)-β-D-glucopyranose bis-*O*-[*tert*-butyl(dimethyl)silyl] ether (98.9 mg, 44% yield); R_f = 0.14 (50% ethyl acetate-hexane)

[00198] (3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]azetidin-2-one (141.5 mg, 0.27 mmol), 6-*O*-(3-bromophenyl)-β-D-glucopyranose bis-*O*-[*tert*-butyl(dimethyl)silyl] ether (98.9 mg, 0.18 mmol), and potassium carbonate (175 μL, 2 M aqueous solution) were dissolved in 1:1 toluene-ethanol (1 mL total volume). The solution was degassed by evacuating the vessel and flushing with argon three times.
Tetrakis(triphenylphosphine)palladium (10.0 mg, 0.009 mmol) was added and the solution degassed twice. The reaction was heated at 85 °C for 1 h. LCMS and TLC (1:1 hexane-ethyl acetate) analysis indicated consumption of the starting glycoside. The reaction was diluted into ethyl acetate (30 mL) and washed with water (2 x 10 mL). The combined aqueous washes were back extracted with ethyl acetate (2 x 10 mL). The

combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by chromatography (12 g silica gel, 50% ethyl acetate-hexane) to afford 6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-β-D-glucopyranose bis-*O*-[*tert*-butyl(dimethyl)silyl] ether (113 mg, 74% yield). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.56 (d, J = 7.8 Hz, 2H), 7.36-7.10 (m, 8H), 7.01-6.80 (m, 6H), 4.70 (t, J = 5.4 Hz, 1H), 4.64 (d, J = 1.8 Hz, 1H), 4.56 (d, J = 6.9 Hz, 1H), 4.35-4.32 (m, 1H), 4.16-4.07 (m, 1H), 3.68-3.58 (m, 2H), 3.51-3.46 (m, 1H), 3.38-3.32 (m, 1H), 3.11-3.09 (m, 1H), 1.98-1.88 (m, 4H), 0.91 (s, 9H), 0.91 (s, 9H), 0.14 (s, 6H), 0.13 (s, 6H) ppm

[00199] 6-*O*-(4'-{(2*S*,3*R*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-α-D-glucopyranose bis-*O*-[*tert*-butyl(dimethyl)silyl] ether (82.3 mg, 0.09 mmol) was dissolved in acetonitrile (10 mL) in a polypropylene centrifuge tube. 48% Hydrofluoric acid (1 mL) was added at room temperature and the reaction monitored by LCMS. Upon completion, 1 equivalent of solid sodium carbonate (2.54 g, 24 mmol) was added and just enough water to dissolve the solid. The reaction was diluted into ethyl acetate (20 mL) and the layers separated. The aqueous solution was extracted with ethyl acetate (3 x10 mL). The combined organic extracts were washed with saturated sodium carbonate (2 x 10 mL), dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by reverse phase preparative HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) to afford 6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-α-D-glucopyranose (54.3 mg, 89% yield). ^{1}H NMR (300 MHz, $CDCl_3$/1% CD_3OD) δ 7.58 (d, J = 7.8 Hz, 2H), 7.39-7.24 (m, 7H), 7.17-7.14 (m, 2H), 7.04-6.92 (m, 5H), 5.23 (d, J = 3.9 Hz, 0.6H), 4.71 (d, J = 1.8 Hz, 1H), 4.66 (t, J = 5.7 Hz, 1H), 4.58 (d, J = 8.1 Hz, 0.4H), 4.40-4.30 (m, 1H), 4.25-4.14 (m, 1H), 3.57-3.48 (m, 2H), 3.16-3.11 (m, 1H), 2.04-1.85 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 630.0

[00200] Example 77. Methyl 6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-α-D-glucopyranoside



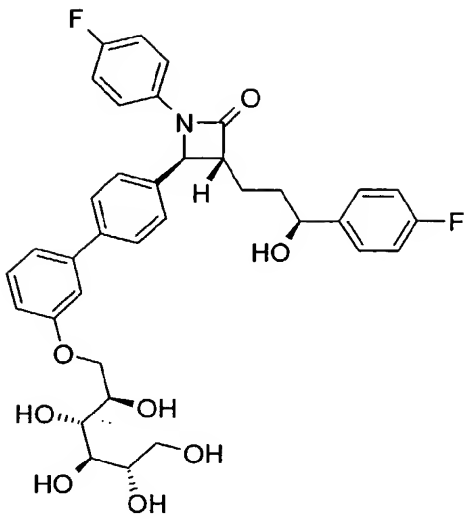
Diethylazodicarboxylate (76.2 mg, 0.44 mmol, 68 μL) was added drop-wise to methyl 2,3,4-tri-*O*-benzyl-α-D-glucopyranoside (184.8 mg, 0.40 mmol), 3-bromophenol (72.3 mg, 0.42 mmol), and triphenylphosphine (115.0 mg, 0.44 mmol) dissolved in dry tetrahydrofuran (2 mL) at 0 °C. The reaction was stirred for 16 h warming to room temperature. The reaction was diluted into dichloromethane (30 mL) and washed with 5% sodium bisulfate (2 x 10 mL). The separated organic solution was dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by chromatography (20% ethyl acetate-dichloromethane) to afford methyl 2,3,4-tri-*O*-benzyl-6-*O*-(3-bromophenyl)-α-D-glucopyranoside (216 mg, 87% yield)

[00201] (3*R*,4*S*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]azetidin-2-one (64.1 mg, 0.12 mmol), methyl 2,3,4-tri-*O*-benzyl-6-*O*-(3-bromophenyl)-D-glucopyranoside (54.6 mg, 0.09 mmol), and potassium carbonate (88 μL, 2 M aqueous solution) were dissolved in 1:1 toluen-ethanol (1 mL total volume). The solution was degassed by evacuating the vessel and flushing with argon three times. Tetrakis(triphenylphosphine)palladium (5.1 mg, 0.004 mmol) was added and the solution degassed twice. The reaction was heated at 85 °C for 1 h. LCMS and TLC (1:1 hexane-ethyl acetate) analysis indicated consumption of the starting glycoside. The reaction was diluted into ethyl acetate (30 mL) and washed

with water (2 x 10 mL). The combined aqueous washes were back extracted with ethyl acetate (2 x 10 mL). The combined organic extracts were dried over anhydrous sodium sulfate, filtered, concentrated *in vacuo* and purified by chromatography (12 g silica gel, 20% to 50% ethyl acetate-hexane) to afford methyl 2,3,4-tri-*O*-benzyl-6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-α-D-glucopyranoside (70.0 mg, 85% yield). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.55 (d, J = 8.1 Hz, 2H), 7.39-6.84 (m, 29H), 5.01 (d, J = 10.8 Hz, 1H), 4.89-4.80 (m, 3H), 4.73-4.64 (m, 4H), 4.52 (d, J = 11.1 Hz, 1H), 4.15-4.12 (m, 2H), 4.08-4.-1 (m, 1H), 3.94-3.90 (m, 1H), 3.77-3.71 (m, 1H), 3.62 (dd, J = 3.6 Hz, J = 9.6 Hz, 1H), 3.39 (s, 3H), 3.13-3.10 (m, 1H), 2.03-1.89 (m, 4H) ppm

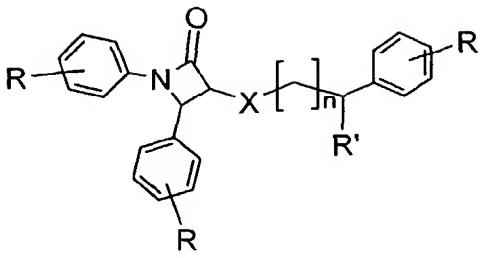
[00202] Methyl 2,3,4-tri-*O*-benzyl-6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-α-D-glucopyranoside (70 mg, 0.08 mmol) was dissolved in absolute ethanol (3 mL). 10% Pd/C (wet, 14% w/w) was added and the vessel sealed. The solution was degassed by evacuation and flushing with hydrogen gas at balloon pressure. The reaction was monitored by TLC (1:1 hexane-ethyl acetate). Upon completion, the catalyst was filtered by passing through a plug of Celite® and washing with additional ethanol. The filtrate was concentrated *in vacuo* and purified by preparative HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) affording methyl 6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-α-D-glucopyranoside (18.1 mg, 36% yield); ^{1}H NMR (300 MHz, $CDCl_3$/1% CD_3OD) δ 7.58 (d, J = 8.4 Hz, 2H), 7.38-7.23 (m, 7H), 7.17-7.14 (m, 2H), 7.04-6.92 (m, 5H), 4.80 (d, J = 3.9 Hz, 1H), 4.70 (d, J = 2.4 Hz, 1H), 4.67 (t, J = 5.7 Hz, 1H), 4.37-4.33 (m, 1H), 4.26-4.21 (m, 1H), 3.92-3.87 (m, 1H), 3.74-3.45 (m, 3H), 3.42 (s, 3H), 3.18-3.10 (m, 1H), 2.01-1.88 (m, 4H) ppm; MS $[M\text{-}OH]^+$ 644.0

[00203] Example 78. 6-*O*-(4'-{(2*S*,3*R*)-1-(4-Fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glucitol

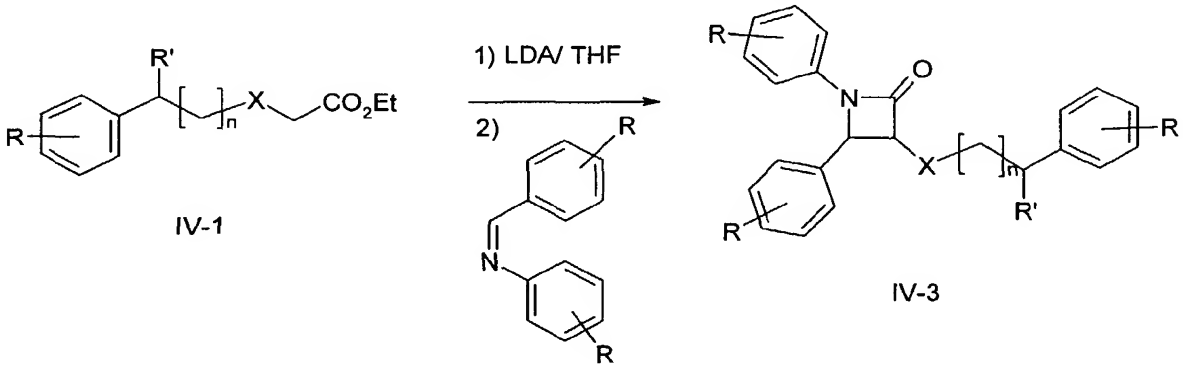


Sodium borohydride (1.6 mg, 0.04 mmol) was added to 6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose (26.3 mg, 0.04 mmol) dissolved in 80:20 acetonitrile-water (1 mL) at room temperature. The reaction was stirred for 10 min at room temperature monitoring by LCMS. Upon completion, the reaction was diluted with 50:50 acetonitrile:water (3 mL) and filtered through a Whatman 0.45 μM glass microfiber filter then purified by preparative HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 95% acetonitrile-0.1% trifluoroacetic acid in water) affording 6-*O*-(4'-{(2*S*,3*R*)-1-(4-fluorophenyl)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glucitol (21.2 mg, 80% yield). ^{1}H NMR (300 MHz, $CDCl_3$/1% CD_3OD) δ 7.58 (d, J = 8.1 Hz, 2H), 7.39-7.24 (m, 7H), 7.17-7.15 (m, 2H), 7.04-6.92 (m, 5H), 4.71 (d, J = 2.1 Hz, 1H), 4.68 (t, J = 6.3 Hz, 1H), 4.31-4.27 (m, 1H), .19-4.14 (m, 1H), 4.08-4.02 (m, 1H), 3.97-3.95 (m, 1H), 3.86-3.65 (m, 4H), 3.14-3.12 (m, 1H), 2.01-1.88 (m, 4H) ppm; MS $[M+HCO_2^-]^-$ 694.0

Scheme IV



[00204] Illustrated in Scheme IV is the general method for the preparation of cholesterol absorption inhibitors of general formula IV-3. Imines IV-2 are made by refluxing anilines with the appropriate aldehydes in isopropanol. Condensation of imine IV-2 with the ester enolate of compound IV-1 affords the azetidinone IV-3. In the case where X is sulfur, one equivalent of an appropriate oxidizing agent such as MCPBA can be used to convert to the sulfoxide, two equivalents can be used to synthesize the sulfone. Where X is nitrogen, one equivalent of an appropriate oxidizing agent can be used to convert the secondary amine to a hydroxylamine (following deprotection).



IV-1 IV-2 IV-3

[00205] The following examples were also prepared according to the methods described above:

[00206] Example 81. (3R,4S)-4-(3',4'-dimethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00207] Example 82. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3'-(methylthio)biphenyl-4-yl]azetidin-2-one

[00208] Example 83. (3R,4S)-4-[3'-(dimethylamino)biphenyl-4-yl]-1-(4-

fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00209] Example 84. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-vinylbiphenyl-4-yl)azetidin-2-one

[00210] Example 85. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-5-methoxybiphenyl-2-carbaldehyde

[00211] Example 86. (3R,4S)-4-(3'-aminobiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00212] Example 87. (3R,4S)-4-[4-(2,3-dihydro-1,4-benzodioxin-6-yl)phenyl]-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00213] Example 88. (4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-yl)acetic acid

[00214] Example 89. methyl 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-carboxylate

[00215] Example 90. (3R,4S)-4-(3',5'-dimethylbiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00216] Example 91. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4-(2-naphthyl)phenyl]azetidin-2-one

[00217] Example 92. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3'-(trifluoromethyl)biphenyl-4-yl]azetidin-2-one

[00218] Example 93. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-methylbiphenyl-4-yl)azetidin-2-one

[00219] Example 94. (3R,4S)-4-(4'-fluoro-3'-methylbiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00220] Example 95. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl β-L-glucopyranoside

[00221] Example 96. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(2',3',4'-trimethoxybiphenyl-4-yl)azetidin-2-one

[00222] Example 97. (3R,4S)-4-(2',4'-dimethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00223] Example 98. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-

hydroxypropyl]-4-(2'-methylbiphenyl-4-yl)azetidin-2-one

[00224] Example 99. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-carbaldehyde

[00225] Example 100. (3R,4S)-4-(3'-ethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00226] Example 101. (3R,4S)-4-(4'-ethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00227] Example 102. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-hydroxy-3'-methoxybiphenyl-4-yl)azetidin-2-one

[00228] Example 103. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-propoxybiphenyl-4-yl)azetidin-2-one

[00229] Example 104. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-5-hydroxybiphenyl-2-carbaldehyde

[00230] Example 105. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-isopropoxybiphenyl-4-yl)azetidin-2-one

[00231] Example 106. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-4-hydroxybiphenyl-3-carboxylic acid

[00232] Example 107. (3R,4S)-4-(3',5'-dimethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00233] Example 108. (3R,4S)-4-(2',4'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00234] Example 109. (3R,4S)-4-(3'-butoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00235] Example 110. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-3-hydroxybiphenyl-4-carboxylic acid

[00236] Example 111. (3R,4S)-4-(3'-fluoro-5'-methoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00237] Example 112. (3R,4S)-4-(3'-fluoro-5'-hydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00238] Example 113. (1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-

(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-L-glucitol

[00239] Example 114. (3R,4S)-4-(3',5'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

[00240] Example 115. (4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)boronic acid

[00241] Example 116. (1R)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-yl)-L-glucitol

[00242] Example 117. 2,6-anhydro-1-deoxy-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glycero-D-gulo-heptitol

[00243] Example 118. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-sulfonic acid

[00244] Example 119. (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-mercaptobiphenyl-4-yl)azetidin-2-one

[00245] Example 120. 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-N,N,N-trimethylbiphenyl-3-aminium

[00246] Example 121. (3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one

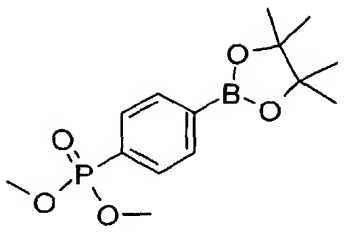
[00247] Example 122. (4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonic acid

[00248] Example 123. (3R,4S)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3-hydroxy-3'-(methylsulfonyl)biphenyl-4-yl]-1-phenylazetidin-2-one

[00249] Example 124. (3R,4S)-1-biphenyl-4-yl-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)azetidin-2-one

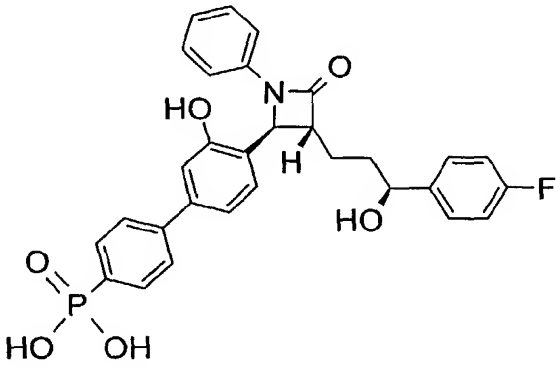
[00250] Example 125. (3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one.

[00251] Example 126. Dimethyl [4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate



prepared in analogous manner to dimethyl [3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate (Example 60) starting with 4-chlorophenol instead of 3-chlorophenol. Dimethyl [4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate product was obtained as a light yellow oil (90%); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.86-7.95 (m, 2H), 7.84-7.82 (m, 2H), 7.43-7.50 (m, 1H), 3.76 (s, 3H), 3.73 (s, 3H), 1.34 (s, 12 H) ppm; MS [M+H] 312, [2M+H] 625.

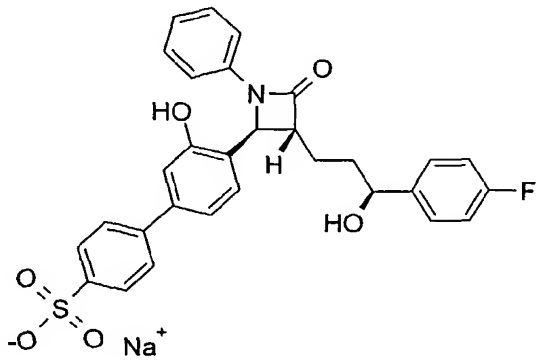
[00252] Example 127. (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid



prepared in analogous manner to Example 61 using dimethyl [4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate (Example 126) in the reaction scheme instead of dimethyl [3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl]phosphonate (Example 60). Final purification by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 30% to 59% acetonitrile-0.1% trifluoroacetic acid in water) afforded (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid as a white powder (62%); ^{1}H NMR (300 MHz,

CD_3OD) δ 7.8 (dd, J = 8.0, 13.0 Hz, 1H), 7.68 (dd, J = 3.2, 8.0 Hz, 1H), 6.9-7.4 (m, 14H), 5.17 (d, J = 2.1 Hz, 1H), 4.60-4.66 (m, 1H), 3.13-3.22 (m, 1H), 1.8-2.1 (m, 4H) ppm; MS [M-H] 546, [2M-H] 1093.

Example 128. Sodium 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonate



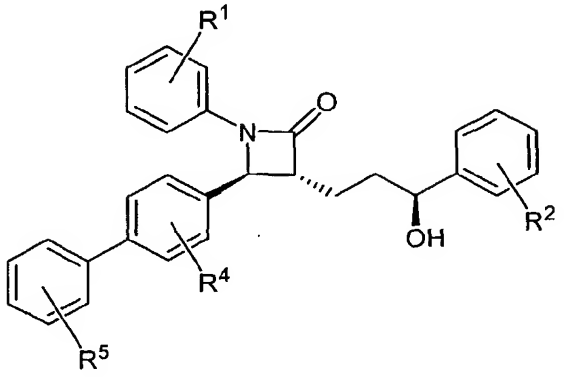
5-Bromo-2-{(2*S*,3*R*)-3-[(3S)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}phenyl acetate (850 mg, 1.36 mmol) and 4-thioanisoleboronic acid (252 mg, 1.50 mmol) were dissolved in dioxane (13.6 mL). Cesium carbonate (882 mg, 2.71 mmol) and solid bis(1-adamantylamine)palladium(0) (113 mg, 0.21 mmol) were added and the vessel was vacuum/nitrogen purged (3x). The reaction was stirred vigorously for 4 h at 80 °C under a nitrogen atmosphere and then cooled and reacted with acetic anhydride (0.70 mL, 7.3 mmol) and 4-dimethylamino-pyridine (185.6 mg, 1.52 mmol). After 15 min, the mixture was poured into 1.0 N hydrochloric acid (60 mL), extracted with 1:1 ethyl acetate-hexane (60 mL), washed with brine (60 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (40 g silica gel, 5% to 50% ethyl acetate-hexane) to afford 4-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-4'-(methylthio)biphenyl-3-yl acetate (478 mg, 52% yield) as a white foam; R_f 0.41 (1:4 ethyl acetate-hexane).

[00253] 4-{(2*S*,3*R*)-3-[(3*S*)-3-{[*tert*-butyl(dimethyl)silyl]oxy}-3-(4-fluorophenyl)propyl]-4-oxo-1-phenylazetidin-2-yl}-4'-(methylthio)biphenyl-3-yl acetate (478 mg, 0.713 mmol) was dissolved in dichloromethane (20 mL) and cooled to 0 °C. 3-Chlorobenzenecarbo-peroxoic acid (134.5 mg, 0.779 mmol) was added in portions while

monitoring by TLC and LCMS to make the arylsulfoxide. Once addition was complete the reaction was poured into quarter saturated sodium bicarbonate solution (60 mL), extracted with dichloromethane (60 mL) and ethyl acetate (60 mL), the combined organic layers were dried over sodium sulfate, filtered and concentrated with toluene. The residue was dissolved in dichloromethane (10 mL) and the Pummerer rearrangement was effected by the addition of trifluoroacetic anhydride (250 μL, 372 mg, 1.77 mmol). The reaction was stirred at room temperature for 8.5 h and then concentrated with toluene and diluted with a solution of degassed methanol (3.0 mL), triethylamine (3.0 mL) and water (1.0 mL). After 2.75 h the golden yellow solution was concentrated, transferred into a polypropylene Falcon® tube with acetonitrile (10.0 mL) and diluted with 48% hydrofluoric acid (1.0 mL). The reaction was stirred for 4 h at room temperature and then poured into 0.5 M potassium phosphate (50 mL), extracted with ethyl acetate (60 mL), washed with water (60 mL) and brine (60 mL), dried over sodium sulfate, filtered, concentrated and purified by chromatography (40 g silica gel, 10% to 100% ethyl acetate-hexane) to afford a mixture of compounds (some impurities and oxidized desired material). The residue was used as is in the next step.

[00254] The residue was dissolved in dichloromethane (10 mL) and added drop-wise to a solution of 3-chlorobenzenecarboperoxoic acid (489 mg, 2.83 mmol) in dichloromethane (10 mL). Dichloromethane (5 mL) was used to help transfer the material and the mixture was stirred at room temperature for 15 min. The reaction was quenched by addition of triethylamine (4 mL), concentrated, dissolved in methanol, filtered through a 0.45 μ Whatman® filter, concentrated again, purified by reverse-phase HPLC (Polaris C18-A 10μ 250 x 21.2 mm column, 5% to 100% acetonitrile-0.1% triethylamine in water) and treated with Dowex® sodium ion exchange resin to afford sodium 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonate (249.0 mg, 57% yield) as a light pale purple solid; ^{1}H NMR (300 MHz, CD_3OD) δ 7.88 (d, J = 8.6 Hz, 2H), 7.59 (d, J = 8.6 Hz, 2H), 7.35-7.19 (m, 7H), 7.14-7.11 (m, 2H), 7.03-6.97 (m, 3H), 5.14 (d, J = 2.2 Hz, 1H), 4.63-4.59 (m, 1H), 3.17-3.08 (m, 1H), 2.04-1.87 (m, 4H) ppm; MS [M-Na] 546.0

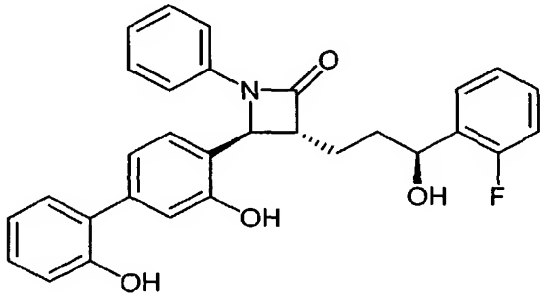
[00255] Also within the invention are compounds described by Table 3, together with Table 4 and Formula VIII which is shown below.



VIII

[00256] In these embodiments, R^1 and R^2 are independently chosen from H, F, CN, Cl, CH_3, OCH_3, OCF_3, OCF_2H, CF_3, CF_2H, and CH_2F; R^4 is chosen from H, Cl, CH_3, OCH_3, OH, $B(OH)_2$, and SH; R^5 is chosen from OH, SO_3H, PO_3H_2, CH_2OH, COOH, CHO, D-glucitol, a C-glysosyl compound and a sugar and only one R substitution is allowed on any aromatic ring. For example, where R^5 is –OH, all of the other substituents on the corresponding aromatic ring are H. Of course, where a given R group is H (e.g., R^1) all of the substituents on the corresponding aromatic ring are also H. In Table 4 when the R^4 substituent position is defined as 3-, the substitution occurs at the position ortho to the azetidinone ring. In Table 4 when the R^4 substituent position is defined as 2-, the substitution occurs at the position meta to the azetidinone ring.

[00257] Each row in Table 3 defines a unique subset of R group substituents which can be systematically substituted in an iterative fashion into Formula VIII at the positions specified by each row of Table 4 to generate specific compounds within Formula VIII. For example, in Table 3, row 1, R^1 is H, R^2 is F, R^4 is OH, and R^5 is OH. Substituting this set of R groups into Formula VIII according to the placement defined by row 1 of Table 4 (i.e., R^1 is ortho, R^2 is ortho, R^4 is 3- and R^5 is ortho) yields



[00258] (3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one.

[00259] Similarly, (3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one is disclosed by the using values in Table 3, row 1 to substitute Formula VIII according to Table 4, row 2.

Tables 5-20 comprise the compounds disclosed by substituting the substituents listed in Table 3 rows 1-16 into Formula VIII according to the placement defined by each row in Table 4. It should be understood that the compounds listed in Tables 5-20 are only a small subset of the compounds described by the systematic iterative substitution of the substituents in each row of Table 3 into generic Formula VIII according to the placement defined by each row of Table 4.

TABLE 3

Row	R1	R2	R4	R5
1	H	F	OH	OH
2	H	F	OH	D-glucitol
3	H	F	OH	SO_3H
4	H	F	OH	PO_3H_2
5	H	H	OH	OH
6	H	H	OH	D-glucitol
7	H	H	OH	SO_3H
8	H	H	OH	PO_3H_2
9	H	Cl	OH	OH
10	H	Cl	OH	D-glucitol
11	H	Cl	OH	SO_3H
12	H	Cl	OH	PO_3H_2
13	F	H	OH	OH
14	F	H	OH	D-glucitol
15	F	H	OH	SO_3H
16	F	H	OH	PO_3H_2
17	F	F	OH	OH
18	F	F	OH	D-glucitol
19	F	F	OH	SO_3H
20	F	F	OH	PO_3H_2
21	F	Cl	OH	OH
22	F	Cl	OH	D-glucitol

23	F	Cl	OH	SO_3H
24	F	Cl	OH	PO_3H_2
25	Cl	H	OH	OH
26	Cl	H	OH	D-glucitol
27	Cl	H	OH	SO_3H
28	Cl	H	OH	PO_3H_2
29	Cl	F	OH	OH
30	Cl	F	OH	D-glucitol
31	Cl	F	OH	SO_3H
32	Cl	F	OH	PO_3H_2
33	Cl	Cl	OH	OH
34	Cl	Cl	OH	D-glucitol
35	Cl	Cl	OH	SO_3H
36	Cl	Cl	OH	PO_3H_2
37	H	H	H	OH
38	H	H	H	D-glucitol
39	H	H	H	SO_3H
40	H	H	H	PO_3H_2
41	H	H	H	CHO
42	H	H	H	COOH
43	H	H	H	CH_2OH
44	H	H	H	sugar
45	H	H	H	C-glycosyl compound
46	H	H	OH	CHO
47	H	H	OH	COOH
48	H	H	OH	CH_2OH
49	H	H	OH	sugar
50	H	H	OH	C-glycosyl compound
51	H	H	CH_3	OH
52	H	H	CH_3	D-glucitol
53	H	H	CH_3	SO_3H
54	H	H	CH_3	PO_3H_2
55	H	H	CH_3	CHO
56	H	H	CH_3	COOH
57	H	H	CH_3	CH_2OH
58	H	H	CH_3	sugar
59	H	H	CH_3	C-glycosyl compound
60	H	H	Cl	OH

61	H	H	Cl	D-glucitol
62	H	H	Cl	SO_3H
63	H	H	Cl	PO_3H_2
64	H	H	Cl	CHO
65	H	H	Cl	COOH
66	H	H	Cl	CH_2OH
67	H	H	Cl	sugar
68	H	H	Cl	C-glycosyl compound
69	H	H	$B(OH)_2$	OH
70	H	H	$B(OH)_2$	D-glucitol
71	H	H	$B(OH)_2$	SO_3H
72	H	H	$B(OH)_2$	PO_3H_2
73	H	H	$B(OH)_2$	CHO
74	H	H	$B(OH)_2$	COOH
75	H	H	$B(OH)_2$	CH_2OH
76	H	H	$B(OH)_2$	sugar
77	H	H	$B(OH)_2$	C-glycosyl compound
78	H	H	SH	OH
79	H	H	SH	D-glucitol
80	H	H	SH	SO_3H
81	H	H	SH	PO_3H_2
82	H	H	SH	CHO
83	H	H	SH	COOH
84	H	H	SH	CH_2OH
85	H	H	SH	sugar
86	H	H	SH	C-glycosyl compound
87	H	H	OCH_3	OH
88	H	H	OCH_3	D-glucitol
89	H	H	OCH_3	SO_3H
90	H	H	OCH_3	PO_3H_2
91	H	H	OCH_3	CHO
92	H	H	OCH_3	COOH
93	H	H	OCH_3	CH_2OH
94	H	H	OCH_3	sugar
95	H	H	OCH_3	C-glycosyl compound
96	H	F	H	OH
97	H	F	H	D-glucitol

98	H	F	H	SO_3H
99	H	F	H	PO_3H_2
100	H	F	H	CHO
101	H	F	H	COOH
102	H	F	H	CH_2OH
103	H	F	H	sugar
104	H	F	H	C-glycosyl compound
105	H	F	OH	CHO
106	H	F	OH	COOH
107	H	F	OH	CH_2OH
108	H	F	OH	sugar
109	H	F	OH	C-glycosyl compound
110	H	F	CH_3 . . .	OH
111	H	F	CH_3	D-glucitol
112	H	F	CH_3	SO_3H
113	H	F	CH_3	PO_3H_2
114	H	F	CH_3	CHO
115	H	F	CH_3	COOH
116	H	F	CH_3	CH_2OH
117	H	F	CH_3	sugar
118	H	F	CH_3	C-glycosyl compound
119	H	F	Cl	OH
120	H	F	Cl	D-glucitol
121	H	F	Cl	SO_3H
122	H	F	Cl	PO_3H_2
123	H	F	Cl	CHO
124	H	F	Cl	COOH
125	H	F	Cl	CH_2OH
126	H	F	Cl	sugar
127	H	F	Cl	C-glycosyl compound
128	H	F	$B(OH)_2$	OH
129	H	F	$B(OH)_2$	D-glucitol
130	H	F	$B(OH)_2$	SO_3H
131	H	F	$B(OH)_2$	PO_3H_2
132	H	F	$B(OH)_2$	CHO
133	H	F	$B(OH)_2$	COOH
134	H	F	$B(OH)_2$	CH_2OH

135	H	F	$B(OH)_2$	sugar
136	H	F	$B(OH)_2$	C-glycosyl compound
137	H	F	SH	OH
138	H	F	SH	D-glucitol
139	H	F	SH	SO_3H
140	H	F	SH	PO_3H_2
141	H	F	SH	CHO
142	H	F	SH	COOH
143	H	F	SH	CH_2OH
144	H	F	SH	sugar
145	H	F	SH	C-glycosyl compound
146	H	F	OCH_3	OH
147	H	F	OCH_3	D-glucitol
148	H	F	OCH_3	SO_3H
149	H	F	OCH_3	PO_3H_2
150	H	F	OCH_3	CHO
151	H	F	OCH_3	COOH
152	H	F	OCH_3	CH_2OH
153	H	F	OCH_3	sugar
154	H	F	OCH_3	C-glycosyl compound
155	H	Cl	H	OH
156	H	Cl	H	D-glucitol
157	H	Cl	H	SO_3H
158	H	Cl	H	PO_3H_2
159	H	Cl	H	CHO
160	H	Cl	H	COOH
161	H	Cl	H	CH_2OH
162	H	Cl	H	sugar
163	H	Cl	H	C-glycosyl compound
164	H	Cl	OH	CHO
165	H	Cl	OH	COOH
166	H	Cl	OH	CH_2OH
167	H	Cl	OH	sugar
168	H	Cl	OH	C-glycosyl compound
169	H	Cl	CH_3	OH
170	H	Cl	CH_3	D-glucitol
171	H	Cl	CH_3	SO_3H
172	H	Cl	CH_3	PO_3H_2

173	H	Cl	CH_3	CHO
174	H	Cl	CH_3	COOH
175	H	Cl	CH_3	CH_2OH
176	H	Cl	CH_3	sugar
177	H	Cl	CH_3	C-glycosyl compound
178	H	Cl	Cl	OH
179	H	Cl	Cl	D-glucitol
180	H	Cl	Cl	SO_3H
181	H	Cl	Cl	PO_3H_2
182	H	Cl	Cl	CHO
183	H	Cl	Cl	COOH
184	H	Cl	Cl	CH_2OH
185	H	Cl	Cl	sugar
186	H	Cl	Cl	C-glycosyl compound
187	H	Cl	$B(OH)_2$	OH
188	H	Cl	$B(OH)_2$	D-glucitol
189	H	Cl	$B(OH)_2$	SO_3H
190	H	Cl	$B(OH)_2$	PO_3H_2
191	H	Cl	$B(OH)_2$	CHO
192	H	Cl	$B(OH)_2$	COOH
193	H	Cl	$B(OH)_2$	CH_2OH
194	H	Cl	$B(OH)_2$	sugar
195	H	Cl	$B(OH)_2$	C-glycosyl compound
196	H	Cl	SH	OH
197	H	Cl	SH	D-glucitol
198	H	Cl	SH	SO_3H
199	H	Cl	SH	PO_3H_2
200	H	Cl	SH	CHO
201	H	Cl	SH	COOH
202	H	Cl	SH	CH_2OH
203	H	Cl	SH	sugar
204	H	Cl	SH	C-glycosyl compound
205	H	Cl	OCH_3	OH
206	H	Cl	OCH_3	D-glucitol
207	H	Cl	OCH_3	SO_3H
208	H	Cl	OCH_3	PO_3H_2
209	H	Cl	OCH_3	CHO

210	H	Cl	OCH_3	COOH
211	H	Cl	OCH_3	CH_2OH
212	H	Cl	OCH_3	sugar
213	H	Cl	OCH_3	C-glycosyl compound
214	H	CN	H	OH
215	H	CN	H	D-glucitol
216	H	CN	H	SO_3H
217	H	CN	H	PO_3H_2
218	H	CN	H	CHO
219	H	CN	H	COOH
220	H	CN	H	CH_2OH
221	H	CN	H	sugar
222	H	CN	H	C-glycosyl compound
223	H	CN	OH	OH
224	H	CN	OH	D-glucitol
225	H	CN	OH	SO_3H
226	H	CN	OH	PO_3H_2
227	H	CN	OH	CHO
228	H	CN	OH	COOH
229	H	CN	OH	CH_2OH
230	H	CN	OH	sugar
231	H	CN	OH	C-glycosyl compound
232	H	CN	CH_3	OH
233	H	CN	CH_3	D-glucitol
234	H	CN	CH_3	SO_3H
235	H	CN	CH_3	PO_3H_2
236	H	CN	CH_3	CHO
237	H	CN	CH_3	COOH
238	H	CN	CH_3	CH_2OH
239	H	CN	CH_3	sugar
240	H	CN	CH_3	C-glycosyl compound
241	H	CN	Cl	OH
242	H	CN	Cl	D-glucitol
243	H	CN	Cl	SO_3H
244	H	CN	Cl	PO_3H_2
245	H	CN	Cl	CHO
246	H	CN	Cl	COOH
247	H	CN	Cl	CH_2OH

248	H	CN	Cl	sugar
249	H	CN	Cl	C-glycosyl compound
250	H	CN	$B(OH)_2$	OH
251	H	CN	$B(OH)_2$	D-glucitol
252	H	CN	$B(OH)_2$	SO_3H
253	H	CN	$B(OH)_2$	PO_3H_2
254	H	CN	$B(OH)_2$	CHO
255	H	CN	$B(OH)_2$	COOH
256	H	CN	$B(OH)_2$	CH_2OH
257	H	CN	$B(OH)_2$	sugar
258	H	CN	$B(OH)_2$	C-glycosyl compound
259	H	CN	SH	OH
260	H	CN	SH	D-glucitol
261	H	CN	SH	SO_3H
262	H	CN	SH	PO_3H_2
263	H	CN	SH	CHO
264	H	CN	SH	COOH
265	H	CN	SH	CH_2OH
266	H	CN	SH	sugar
267	H	CN	SH	C-glycosyl compound
268	H	CN	OCH_3	OH
269	H	CN	OCH_3	D-glucitol
270	H	CN	OCH_3	SO_3H
271	H	CN	OCH_3	PO_3H_2
272	H	CN	OCH_3	CHO
273	H	CN	OCH_3	COOH
274	H	CN	OCH_3	CH_2OH
275	H	CN	OCH_3	sugar
276	H	CN	OCH_3	C-glycosyl compound
277	H	CH_3[a]	H	OH
278	H	CH_3[a]	H	D-glucitol
279	H	CH_3[a]	H	SO_3H
280	H	CH_3[a]	H	PO_3H_2
281	H	CH_3[a]	H	CHO
282	H	CH_3[a]	H	COOH
283	H	CH_3[a]	H	CH_2OH

284	H	CH_3[a]	H	sugar
285	H	CH_3[a]	H	C-glycosyl compound
286	H	CH_3[a]	OH	OH
287	H	CH_3[a]	OH	D-glucitol
288	H	CH_3[a]	OH	SO_3H
289	H	CH_3[a]	OH	PO_3H_2
290	H	CH_3[a]	OH	CHO
291	H	CH_3[a]	OH	COOH
292	H	CH_3[a]	OH	CH_2OH
293	H	CH_3[a]	OH	sugar
294	H	CH_3[a]	OH	C-glycosyl compound
295	H	CH_3[a]	CH_3	OH
296	H	CH_3[a]	CH_3	D-glucitol
297	H	CH_3[a]	CH_3	SO_3H
298	H	CH_3[a]	CH_3	PO_3H_2
299	H	CH_3[a]	CH_3	CHO
300	H	CH_3[a]	CH_3	COOH
301	H	CH_3[a]	CH_3	CH_2OH
302	H	CH_3[a]	CH_3	sugar
303	H	CH_3[a]	CH_3	C-glycosyl compound
304	H	CH_3[a]	Cl	OH
305	H	CH_3[a]	Cl	D-glucitol
306	H	CH_3[a]	Cl	SO_3H
307	H	CH_3[a]	Cl	PO_3H_2
308	H	CH_3[a]	Cl	CHO
309	H	CH_3[a]	Cl	COOH
310	H	CH_3[a]	Cl	CH_2OH
311	H	CH_3[a]	Cl	sugar
312	H	CH_3[a]	Cl	C-glycosyl compound
313	H	CH_3[a]	$B(OH)_2$	OH
314	H	CH_3[a]	$B(OH)_2$	D-glucitol
315	H	CH_3[a]	$B(OH)_2$	SO_3H

316	H	CH_3[a]	$B(OH)_2$	PO_3H_2
317	H	CH_3[a]	$B(OH)_2$	CHO
318	H	CH_3[a]	$B(OH)_2$	COOH
319	H	CH_3[a]	$B(OH)_2$	CH_2OH
320	H	CH_3[a]	$B(OH)_2$	sugar
321	H	CH_3[a]	$B(OH)_2$	C-glycosyl compound
322	H	CH_3[a]	SH	OH
323	H	CH_3[a]	SH	D-glucitol
324	H	CH_3[a]	SH	SO_3H
325	H	CH_3[a]	SH	PO_3H_2
326	H	CH_3[a]	SH	CHO
327	H	CH_3[a]	SH	COOH
328	H	CH_3[a]	SH	CH_2OH
329	H	CH_3[a]	SH	sugar
330	H	CH_3[a]	SH	C-glycosyl compound
331	H	CH_3[a]	OCH_3	OH
332	H	CH_3[a]	OCH_3	D-glucitol
333	H	CH_3[a]	OCH_3	SO_3H
334	H	CH_3[a]	OCH_3	PO_3H_2
335	H	CH_3[a]	OCH_3	CHO
336	H	CH_3[a]	OCH_3	COOH
337	H	CH_3[a]	OCH_3	CH_2OH
338	H	CH_3[a]	OCH_3	sugar
339	H	CH_3[a]	OCH_3	C-glycosyl compound
340	H	OCH3[b]	H	OH
341	H	OCH3[b]	H	D-glucitol
342	H	OCH3[b]	H	SO_3H
343	H	OCH3[b]	H	PO_3H_2
344	H	OCH3[b]	H	CHO
345	H	OCH3[b]	H	COOH
346	H	OCH3[b]	H	CH_2OH
347	H	OCH3[b]	H	sugar
348	H	OCH3[b]	H	C-glycosyl compound

349	H	$OCH3^b$	OH	OH
350	H	$OCH3^b$	OH	D-glucitol
351	H	$OCH3^b$	OH	SO_3H
352	H	$OCH3^b$	OH	PO_3H_2
353	H	$OCH3^b$	OH	CHO
354	H	$OCH3^b$	OH	COOH
355	H	$OCH3^b$	OH	CH_2OH
356	H	$OCH3^b$	OH	sugar
357	H	$OCH3^b$	OH	C-glycosyl compound
358	H	$OCH3^b$	CH_3	OH
359	H	$OCH3^b$	CH_3	D-glucitol
360	H	$OCH3^b$	CH_3	SO_3H
361	H	$OCH3^b$	CH_3	PO_3H_2
362	H	$OCH3^b$	CH_3	CHO
363	H	$OCH3^b$	CH_3	COOH
364	H	$OCH3^b$	CH_3	CH_2OH
365	H	$OCH3^b$	CH_3	sugar
366	H	$OCH3^b$	CH_3	C-glycosyl compound
367	H	$OCH3^b$	Cl	OH
368	H	$OCH3^b$	Cl	D-glucitol
369	H	$OCH3^b$	Cl	SO_3H
370	H	$OCH3^b$	Cl	PO_3H_2
371	H	$OCH3^b$	Cl	CHO
372	H	$OCH3^b$	Cl	COOH
373	H	$OCH3^b$	Cl	CH_2OH
374	H	$OCH3^b$	Cl	sugar
375	H	$OCH3^b$	Cl	C-glycosyl compound
376	H	$OCH3^b$	$B(OH)_2$	OH
377	H	$OCH3^b$	$B(OH)_2$	D-glucitol
378	H	$OCH3^b$	$B(OH)_2$	SO_3H
379	H	$OCH3^b$	$B(OH)_2$	PO_3H_2
380	H	$OCH3^b$	$B(OH)_2$	CHO
381	H	$OCH3^b$	$B(OH)_2$	COOH

382	H	OCH3[b]	$B(OH)_2$	CH_2OH
383	H	OCH3[b]	$B(OH)_2$	sugar
384	H	OCH3[b]	$B(OH)_2$	C-glycosyl compound
385	H	OCH3[b]	SH	OH
386	H	OCH3[b]	SH	D-glucitol
387	H	OCH3[b]	SH	SO_3H
388	H	OCH3[b]	SH	PO_3H_2
389	H	OCH3[b]	SH	CHO
390	H	OCH3[b]	SH	COOH
391	H	OCH3[b]	SH	CH_2OH
392	H	OCH3[b]	SH	sugar
393	H	OCH3[b]	SH	C-glycosyl compound
394	H	OCH3[b]	OCH_3	OH
395	H	OCH3[b]	OCH_3	D-glucitol
396	H	OCH3[b]	OCH_3	SO_3H
397	H	OCH3[b]	OCH_3	PO_3H_2
398	H	OCH3[b]	OCH_3	CHO
399	H	OCH3[b]	OCH_3	COOH
400	H	OCH3[b]	OCH_3	CH_2OH
401	H	OCH3[b]	OCH_3	sugar
402	H	OCH3[b]	OCH_3	C-glycosyl compound
403	F	H	H	OH
404	F	H	H	D-glucitol
405	F	H	H	SO_3H
406	F	H	H	PO_3H_2
407	F	H	H	CHO
408	F	H	H	COOH
409	F	H	H	CH_2OH
410	F	H	H	sugar
411	F	H	H	C-glycosyl compound
412	F	H	OH	CHO
413	F	H	OH	COOH
414	F	H	OH	CH_2OH
415	F	H	OH	sugar
416	F	H	OH	C-glycosyl compound

417	F	H	CH_3	OH
418	F	H	CH_3	D-glucitol
419	F	H	CH_3	SO_3H
420	F	H	CH_3	PO_3H_2
421	F	H	CH_3	CHO
422	F	H	CH_3	COOH
423	F	H	CH_3	CH_2OH
424	F	H	CH_3	sugar
425	F	H	CH_3	C-glycosyl compound
426	F	H	Cl	OH
427	F	H	Cl	D-glucitol
428	F	H	Cl	SO_3H
429	F	H	Cl	PO_3H_2
430	F	H	Cl	CHO
431	F	H	Cl	COOH
432	F	H	Cl	CH_2OH
433	F	H	Cl	sugar
434	F	H	Cl	C-glycosyl compound
435	F	H	$B(OH)_2$	OH
436	F	H	$B(OH)_2$	D-glucitol
437	F	H	$B(OH)_2$	SO_3H
438	F	H	$B(OH)_2$	PO_3H_2
439	F	H	$B(OH)_2$	CHO
440	F	H	$B(OH)_2$	COOH
441	F	H	$B(OH)_2$	CH_2OH
442	F	H	$B(OH)_2$	sugar
443	F	H	$B(OH)_2$	C-glycosyl compound
444	F	H	SH	OH
445	F	H	SH	D-glucitol
446	F	H	SH	SO_3H
447	F	H	SH	PO_3H_2
448	F	H	SH	CHO
449	F	H	SH	COOH
450	F	H	SH	CH_2OH
451	F	H	SH	sugar
452	F	H	SH	C-glycosyl compound
453	F	H	OCH_3	OH

454	F	H	OCH_3	D-glucitol
455	F	H	OCH_3	SO_3H
456	F	H	OCH_3	PO_3H_2
457	F	H	OCH_3	CHO
458	F	H	OCH_3	COOH
459	F	H	OCH_3	CH_2OH
460	F	H	OCH_3	sugar
461	F	H	OCH_3	C-glycosyl compound
462	F	F	H	OH
463	F	F	H	D-glucitol
464	F	F	H	SO_3H
465	F	F	H	PO_3H_2
466	F	F	H	CHO
467	F	F	H	COOH
468	F	F	H	CH_2OH
469	F	F	H	sugar
470	F	F	H	C-glycosyl compound
471	F	F	OH	CHO
472	F	F	OH	COOH
473	F	F	OH	CH_2OH
474	F	F	OH	sugar
475	F	F	OH	C-glycosyl compound
476	F	F	CH_3	OH
477	F	F	CH_3	D-glucitol
478	F	F	CH_3	SO_3H
479	F	F	CH_3	PO_3H_2
480	F	F	CH_3	CHO
481	F	F	CH_3	COOH
482	F	F	CH_3	CH_2OH
483	F	F	CH_3	sugar
484	F	F	CH_3	C-glycosyl compound
485	F	F	Cl	OH
486	F	F	Cl	D-glucitol
487	F	F	Cl	SO_3H
488	F	F	Cl	PO_3H_2
489	F	F	Cl	CHO
490	F	F	Cl	COOH

491	F	F	Cl	CH_2OH
492	F	F	Cl	sugar
493	F	F	Cl	C-glycosyl compound
494	F	F	$B(OH)_2$	OH
495	F	F	$B(OH)_2$	D-glucitol
496	F	F	$B(OH)_2$	SO_3H
497	F	F	$B(OH)_2$	PO_3H_2
498	F	F	$B(OH)_2$	CHO
499	F	F	$B(OH)_2$	COOH
500	F	F	$B(OH)_2$	CH_2OH
501	F	F	$B(OH)_2$	sugar
502	F	F	$B(OH)_2$	C-glycosyl compound
503	F	F	SH	OH
504	F	F	SH	D-glucitol
505	F	F	SH	SO_3H
506	F	F	SH	PO_3H_2
507	F	F	SH	CHO
508	F	F	SH	COOH
509	F	F	SH	CH_2OH
510	F	F	SH	sugar
511	F	F	SH	C-glycosyl compound
512	F	F	OCH_3	OH
513	F	F	OCH_3	D-glucitol
514	F	F	OCH_3	SO_3H
515	F	F	OCH_3	PO_3H_2
516	F	F	OCH_3	CHO
517	F	F	OCH_3	COOH
518	F	F	OCH_3	CH_2OH
519	F	F	OCH_3	sugar
520	F	F	OCH_3	C-glycosyl compound
521	F	Cl	H	OH
522	F	Cl	H	D-glucitol
523	F	Cl	H	SO_3H
524	F	Cl	H	PO_3H_2
525	F	Cl	H	CHO
526	F	Cl	H	COOH
527	F	Cl	H	CH_2OH

528	F	Cl	H	sugar
529	F	Cl	H	C-glycosyl compound
530	F	Cl	OH	CHO
531	F	Cl	OH	COOH
532	F	Cl	OH	CH_2OH
533	F	Cl	OH	sugar
534	F	Cl	OH	C-glycosyl compound
535	F	Cl	CH_3	OH
536	F	Cl	CH_3	D-glucitol
537	F	Cl	CH_3	SO_3H
538	F	Cl	CH_3	PO_3H_2
539	F	Cl	CH_3	CHO
540	F	Cl	CH_3	COOH
541	F	Cl	CH_3	CH_2OH
542	F	Cl	CH_3	sugar
543	F	Cl	CH_3	C-glycosyl compound
544	F	Cl	Cl	OH
545	F	Cl	Cl	D-glucitol
546	F	Cl	Cl	SO_3H
547	F	Cl	Cl	PO_3H_2
548	F	Cl	Cl	CHO
549	F	Cl	Cl	COOH
550	F	Cl	Cl	CH_2OH
551	F	Cl	Cl	sugar
552	F	Cl	Cl	C-glycosyl compound
553	F	Cl	$B(OH)_2$	OH
554	F	Cl	$B(OH)_2$	D-glucitol
555	F	Cl	$B(OH)_2$	SO_3H
556	F	Cl	$B(OH)_2$	PO_3H_2
557	F	Cl	$B(OH)_2$	CHO
558	F	Cl	$B(OH)_2$	COOH
559	F	Cl	$B(OH)_2$	CH_2OH
560	F	Cl	$B(OH)_2$	sugar
561	F	Cl	$B(OH)_2$	C-glycosyl compound
562	F	Cl	SH	OH
563	F	Cl	SH	D-glucitol
564	F	Cl	SH	SO_3H

565	F	Cl	SH	PO_3H_2
566	F	Cl	SH	CHO
567	F	Cl	SH	COOH
568	F	Cl	SH	CH_2OH
569	F	Cl	SH	sugar
570	F	Cl	SH	C-glycosyl compound
571	F	Cl	OCH_3	OH
572	F	Cl	OCH_3	D-glucitol
573	F	Cl	OCH_3	SO_3H
574	F	Cl	OCH_3	PO_3H_2
575	F	Cl	OCH_3	CHO
576	F	Cl	OCH_3	COOH
577	F	Cl	OCH_3	CH_2OH
578	F	Cl	OCH_3	sugar
579	F	Cl	OCH_3	C-glycosyl compound
580	F	CN	H	OH
581	F	CN	H	D-glucitol
582	F	CN	H	SO_3H
583	F	CN	H	PO_3H_2
584	F	CN	H	CHO
585	F	CN	H	COOH
586	F	CN	H	CH_2OH
587	F	CN	H	sugar
588	F	CN	H	C-glycosyl compound
589	F	CN	OH	OH
590	F	CN	OH	D-glucitol
591	F	CN	OH	SO_3H
592	F	CN	OH	PO_3H_2
593	F	CN	OH	CHO
594	F	CN	OH	COOH
595	F	CN	OH	CH_2OH
596	F	CN	OH	sugar
597	F	CN	OH	C-glycosyl compound
598	F	CN	CH_3	OH
599	F	CN	CH_3	D-glucitol
600	F	CN	CH_3	SO_3H
601	F	CN	CH_3	PO_3H_2
602	F	CN	CH_3	CHO

603	F	CN	CH_3	COOH
604	F	CN	CH_3	CH_2OH
605	F	CN	CH_3	sugar
606	F	CN	CH_3	C-glycosyl compound
607	F	CN	Cl	OH
608	F	CN	Cl	D-glucitol
609	F	CN	Cl	SO_3H
610	F	CN	Cl	PO_3H_2
611	F	CN	Cl	CHO
612	F	CN	Cl	COOH
613	F	CN	Cl	CH_2OH
614	F	CN	Cl	sugar
615	F	CN	Cl	C-glycosyl compound
616	F	CN	$B(OH)_2$	OH
617	F	CN	$B(OH)_2$	D-glucitol
618	F	CN	$B(OH)_2$	SO_3H
619	F	CN	$B(OH)_2$	PO_3H_2
620	F	CN	$B(OH)_2$	CHO
621	F	CN	$B(OH)_2$	COOH
622	F	CN	$B(OH)_2$	CH_2OH
623	F	CN	$B(OH)_2$	sugar
624	F	CN	$B(OH)_2$	C-glycosyl compound
625	F	CN	SH	OH
626	F	CN	SH	D-glucitol
627	F	CN	SH	SO_3H
628	F	CN	SH	PO_3H_2
629	F	CN	SH	CHO
630	F	CN	SH	COOH
631	F	CN	SH	CH_2OH
632	F	CN	SH	sugar
633	F	CN	SH	C-glycosyl compound
634	F	CN	OCH_3	OH
635	F	CN	OCH_3	D-glucitol
636	F	CN	OCH_3	SO_3H
637	F	CN	OCH_3	PO_3H_2
638	F	CN	OCH_3	CHO
639	F	CN	OCH_3	COOH

640	F	CN	OCH_3	CH_2OH
641	F	CN	OCH_3	sugar
642	F	CN	OCH_3	C-glycosyl compound
643	F	CH_3[a]	H	OH
644	F	CH_3[a]	H	D-glucitol
645	F	CH_3[a]	H	SO_3H
646	F	CH_3[a]	H	PO_3H_2
647	F	CH_3[a]	H	CHO
648	F	CH_3[a]	H	COOH
649	F	CH_3[a]	H	CH_2OH
650	F	CH_3[a]	H	sugar
651	F	CH_3[a]	H	C-glycosyl compound
652	F	CH_3[a]	OH	OH
653	F	CH_3[a]	OH	D-glucitol
654	F	CH_3[a]	OH	SO_3H
655	F	CH_3[a]	OH	PO_3H_2
656	F	CH_3[a]	OH	CHO
657	F	CH_3[a]	OH	COOH
658	F	CH_3[a]	OH	CH_2OH
659	F	CH_3[a]	OH	sugar
660	F	CH_3[a]	OH	C-glycosyl compound
661	F	CH_3[a]	CH_3	OH
662	F	CH_3[a]	CH_3	D-glucitol
663	F	CH_3[a]	CH_3	SO_3H
664	F	CH_3[a]	CH_3	PO_3H_2
665	F	CH_3[a]	CH_3	CHO
666	F	CH_3[a]	CH_3	COOH
667	F	CH_3[a]	CH_3	CH_2OH
668	F	CH_3[a]	CH_3	sugar
669	F	CH_3[a]	CH_3	C-glycosyl compound
670	F	CH_3[a]	Cl	OH
671	F	CH_3[a]	Cl	D-glucitol
672	F	CH_3[a]	Cl	SO_3H

673	F	CH_3[a]	Cl	PO_3H_2
674	F	CH_3[a]	Cl	CHO
675	F	CH_3[a]	Cl	COOH
676	F	CH_3[a]	Cl	CH_2OH
677	F	CH_3[a]	Cl	sugar
678	F	CH_3[a]	Cl	C-glycosyl compound
679	F	CH_3[a]	$B(OH)_2$	OH
680	F	CH_3[a]	$B(OH)_2$	D-glucitol
681	F	CH_3[a]	$B(OH)_2$	SO_3H
682	F	CH_3[a]	$B(OH)_2$	PO_3H_2
683	F	CH_3[a]	$B(OH)_2$	CHO
684	F	CH_3[a]	$B(OH)_2$	COOH
685	F	CH_3[a]	$B(OH)_2$	CH_2OH
686	F	CH_3[a]	$B(OH)_2$	sugar
687	F	CH_3[a]	$B(OH)_2$	C-glycosyl compound
688	F	CH_3[a]	SH	OH
689	F	CH_3[a]	SH	D-glucitol
690	F	CH_3[a]	SH	SO_3H
691	F	CH_3[a]	SH	PO_3H_2
692	F	CH_3[a]	SH	CHO
693	F	CH_3[a]	SH	COOH
694	F	CH_3[a]	SH	CH_2OH
695	F	CH_3[a]	SH	sugar
696	F	CH_3[a]	SH	C-glycosyl compound
697	F	CH_3[a]	OCH_3	OH
698	F	CH_3[a]	OCH_3	D-glucitol
699	F	CH_3[a]	OCH_3	SO_3H
700	F	CH_3[a]	OCH_3	PO_3H_2
701	F	CH_3[a]	OCH_3	CHO
702	F	CH_3[a]	OCH_3	COOH
703	F	CH_3[a]	OCH_3	CH_2OH
704	F	CH_3[a]	OCH_3	sugar

705	F	CH_3[a]	OCH_3	C-glycosyl compound
706	F	OCH3[b]	H	OH
707	F	OCH3[b]	H	D-glucitol
708	F	OCH3[b]	H	SO_3H
709	F	OCH3[b]	H	PO_3H_2
710	F	OCH3[b]	H	CHO
711	F	OCH3[b]	H	COOH
712	F	OCH3[b]	H	CH_2OH
713	F	OCH3[b]	H	sugar
714	F	OCH3[b]	H	C-glycosyl compound
715	F	OCH3[b]	OH	OH
716	F	OCH3[b]	OH	D-glucitol
717	F	OCH3[b]	OH	SO_3H
718	F	OCH3[b]	OH	PO_3H_2
719	F	OCH3[b]	OH	CHO
720	F	OCH3[b]	OH	COOH
721	F	OCH3[b]	OH	CH_2OH
722	F	OCH3[b]	OH	sugar
723	F	OCH3[b]	OH	C-glycosyl compound
724	F	OCH3[b]	CH_3	OH
725	F	OCH3[b]	CH_3	D-glucitol
726	F	OCH3[b]	CH_3	SO_3H
727	F	OCH3[b]	CH_3	PO_3H_2
728	F	OCH3[b]	CH_3	CHO
729	F	OCH3[b]	CH_3	COOH
730	F	OCH3[b]	CH_3	CH_2OH
731	F	OCH3[b]	CH_3	sugar
732	F	OCH3[b]	CH_3	C-glycosyl compound
733	F	OCH3[b]	Cl	OH
734	F	OCH3[b]	Cl	D-glucitol
735	F	OCH3[b]	Cl	SO_3H
736	F	OCH3[b]	Cl	PO_3H_2
737	F	OCH3[b]	Cl	CHO
738	F	OCH3[b]	Cl	COOH

739	F	OCH3[b]	Cl	CH_2OH
740	F	OCH3[b]	Cl	sugar
741	F	OCH3[b]	Cl	C-glycosyl compound
742	F	OCH3[b]	$B(OH)_2$	OH
743	F	OCH3[b]	$B(OH)_2$	D-glucitol
744	F	OCH3[b]	$B(OH)_2$	SO_3H
745	F	OCH3[b]	$B(OH)_2$	PO_3H_2
746	F	OCH3[b]	$B(OH)_2$	CHO
747	F	OCH3[b]	$B(OH)_2$	COOH
748	F	OCH3[b]	$B(OH)_2$	CH_2OH
749	F	OCH3[b]	$B(OH)_2$	sugar
750	F	OCH3[b]	$B(OH)_2$	C-glycosyl compound
751	F	OCH3[b]	SH	OH
752	F	OCH3[b]	SH	D-glucitol
753	F	OCH3[b]	SH	SO_3H
754	F	OCH3[b]	SH	PO_3H_2
755	F	OCH3[b]	SH	CHO
756	F	OCH3[b]	SH	COOH
757	F	OCH3[b]	SH	CH_2OH
758	F	OCH3[b]	SH	sugar
759	F	OCH3[b]	SH	C-glycosyl compound
760	F	OCH3[b]	OCH_3	OH
761	F	OCH3[b]	OCH_3	D-glucitol
762	F	OCH3[b]	OCH_3	SO_3H
763	F	OCH3[b]	OCH_3	PO_3H_2
764	F	OCH3[b]	OCH_3	CHO
765	F	OCH3[b]	OCH_3	COOH
766	F	OCH3[b]	OCH_3	CH_2OH
767	F	OCH3[b]	OCH_3	sugar
768	F	OCH3[b]	OCH_3	C-glycosyl compound
769	Cl	H	H	OH
770	Cl	H	H	D-glucitol
771	Cl	H	H	SO_3H
772	Cl	H	H	PO_3H_2

773	Cl	H	H	CHO
774	Cl	H	H	COOH
775	Cl	H	H	CH_2OH
776	Cl	H	H	sugar
777	Cl	H	H	C-glycosyl compound
778	Cl	H	OH	CHO
779	Cl	H	OH	COOH
780	Cl	H	OH	CH_2OH
781	Cl	H	OH	sugar
782	Cl	H	OH	C-glycosyl compound
783	Cl	H	CH_3	OH
784	Cl	H	CH_3	D-glucitol
785	Cl	H	CH_3	SO_3H
786	Cl	H	CH_3	PO_3H_2
787	Cl	H	CH_3	CHO
788	Cl	H	CH_3	COOH
789	Cl	H	CH_3	CH_2OH
790	Cl	H	CH_3	sugar
791	Cl	H	CH_3	C-glycosyl compound
792	Cl	H	Cl	OH
793	Cl	H	Cl	D-glucitol
794	Cl	H	Cl	SO_3H
795	Cl	H	Cl	PO_3H_2
796	Cl	H	Cl	CHO
797	Cl	H	Cl	COOH
798	Cl	H	Cl	CH_2OH
799	Cl	H	Cl	sugar
800	Cl	H	Cl	C-glycosyl compound
801	Cl	H	$B(OH)_2$	OH
802	Cl	H	$B(OH)_2$	D-glucitol
803	Cl	H	$B(OH)_2$	SO_3H
804	Cl	H	$B(OH)_2$	PO_3H_2
805	Cl	H	$B(OH)_2$	CHO
806	Cl	H	$B(OH)_2$	COOH
807	Cl	H	$B(OH)_2$	CH_2OH
808	Cl	H	$B(OH)_2$	sugar
809	Cl	H	$B(OH)_2$	C-glycosyl compound

810	Cl	H	SH	OH
811	Cl	H	SH	D-glucitol
812	Cl	H	SH	SO_3H
813	Cl	H	SH	PO_3H_2
814	Cl	H	SH	CHO
815	Cl	H	SH	COOH
816	Cl	H	SH	CH_2OH
817	Cl	H	SH	sugar
818	Cl	H	SH	C-glycosyl compound
819	Cl	H	OCH_3	OH
820	Cl	H	OCH_3	D-glucitol
821	Cl	H	OCH_3	SO_3H
822	Cl	H	OCH_3	PO_3H_2
823	Cl	H	OCH_3	CHO
824	Cl	H	OCH_3	COOH
825	Cl	H	OCH_3	CH_2OH
826	Cl	H	OCH_3	sugar
827	Cl	H	OCH_3	C-glycosyl compound
828	Cl	F	H	OH
829	Cl	F	H	D-glucitol
830	Cl	F	H	SO_3H
831	Cl	F	H	PO_3H_2
832	Cl	F	H	CHO
833	Cl	F	H	COOH
834	Cl	F	H	CH_2OH
835	Cl	F	H	sugar
836	Cl	F	H	C-glycosyl compound
837	Cl	F	OH	CHO
838	Cl	F	OH	COOH
839	Cl	F	OH	CH_2OH
840	Cl	F	OH	sugar
841	Cl	F	OH	C-glycosyl compound
842	Cl	F	CH_3	OH
843	Cl	F	CH_3	D-glucitol
844	Cl	F	CH_3	SO_3H
845	Cl	F	CH_3	PO_3H_2
846	Cl	F	CH_3	CHO
847	Cl	F	CH_3	COOH

848	Cl	F	CH_3	CH_2OH
849	Cl	F	CH_3	sugar
850	Cl	F	CH_3	C-glycosyl compound
851	Cl	F	Cl	OH
852	Cl	F	Cl	D-glucitol
853	Cl	F	Cl	SO_3H
854	Cl	F	Cl	PO_3H_2
855	Cl	F	Cl	CHO
856	Cl	F	Cl	COOH
857	Cl	F	Cl	CH_2OH
858	Cl	F	Cl	sugar
859	Cl	F	Cl	C-glycosyl compound
860	Cl	F	$B(OH)_2$	OH
861	Cl	F	$B(OH)_2$	D-glucitol
862	Cl	F	$B(OH)_2$	SO_3H
863	Cl	F	$B(OH)_2$	PO_3H_2
864	Cl	F	$B(OH)_2$	CHO
865	Cl	F	$B(OH)_2$	COOH
866	Cl	F	$B(OH)_2$	CH_2OH
867	Cl	F	$B(OH)_2$	sugar
868	Cl	F	$B(OH)_2$	C-glycosyl compound
869	Cl	F	SH	OH
870	Cl	F	SH	D-glucitol
871	Cl	F	SH	SO_3H
872	Cl	F	SH	PO_3H_2
873	Cl	F	SH	CHO
874	Cl	F	SH	COOH
875	Cl	F	SH	CH_2OH
876	Cl	F	SH	sugar
877	Cl	F	SH	C-glycosyl compound
878	Cl	F	OCH_3	OH
879	Cl	F	OCH_3	D-glucitol
880	Cl	F	OCH_3	SO_3H
881	Cl	F	OCH_3	PO_3H_2
882	Cl	F	OCH_3	CHO
883	Cl	F	OCH_3	COOH
884	Cl	F	OCH_3	CH_2OH

885	Cl	F	OCH_3	sugar
886	Cl	F	OCH_3	C-glycosyl compound
887	Cl	Cl	H	OH
888	Cl	Cl	H	D-glucitol
889	Cl	Cl	H	SO_3H
890	Cl	Cl	H	PO_3H_2
891	Cl	Cl	H	CHO
892	Cl	Cl	H	COOH
893	Cl	Cl	H	CH_2OH
894	Cl	Cl	H	sugar
895	Cl	Cl	H	C-glycosyl compound
896	Cl	Cl	OH	CHO
897	Cl	Cl	OH	COOH
898	Cl	Cl	OH	CH_2OH
899	Cl	Cl	OH	sugar
900	Cl	Cl	OH	C-glycosyl compound
901	Cl	Cl	CH_3	OH
902	Cl	Cl	CH_3	D-glucitol
903	Cl	Cl	CH_3	SO_3H
904	Cl	Cl	CH_3	PO_3H_2
905	Cl	Cl	CH_3	CHO
906	Cl	Cl	CH_3	COOH
907	Cl	Cl	CH_3	CH_2OH
908	Cl	Cl	CH_3	sugar
909	Cl	Cl	CH_3	C-glycosyl compound
910	Cl	Cl	Cl	OH
911	Cl	Cl	Cl	D-glucitol
912	Cl	Cl	Cl	SO_3H
913	Cl	Cl	Cl	PO_3H_2
914	Cl	Cl	Cl	CHO
915	Cl	Cl	Cl	COOH
916	Cl	Cl	Cl	CH_2OH
917	Cl	Cl	Cl	sugar
918	Cl	Cl	Cl	C-glycosyl compound
919	Cl	Cl	$B(OH)_2$	OH
920	Cl	Cl	$B(OH)_2$	D-glucitol
921	Cl	Cl	$B(OH)_2$	SO_3H
922	Cl	Cl	$B(OH)_2$	PO_3H_2

923	Cl	Cl	$B(OH)_2$	CHO
924	Cl	Cl	$B(OH)_2$	COOH
925	Cl	Cl	$B(OH)_2$	CH_2OH
926	Cl	Cl	$B(OH)_2$	sugar
927	Cl	Cl	$B(OH)_2$	C-glycosyl compound
928	Cl	Cl	SH	OH
929	Cl	Cl	SH	D-glucitol
930	Cl	Cl	SH	SO_3H
931	Cl	Cl	SH	PO_3H_2
932	Cl	Cl	SH	CHO
933	Cl	Cl	SH	COOH
934	Cl	Cl	SH	CH_2OH
935	Cl	Cl	SH	sugar
936	Cl	Cl	SH	C-glycosyl compound
937	Cl	Cl	OCH_3	OH
938	Cl	Cl	OCH_3	D-glucitol
939	Cl	Cl	OCH_3	SO_3H
940	Cl	Cl	OCH_3	PO_3H_2
941	Cl	Cl	OCH_3	CHO
942	Cl	Cl	OCH_3	COOH
943	Cl	Cl	OCH_3	CH_2OH
944	Cl	Cl	OCH_3	sugar
945	Cl	Cl	OCH_3	C-glycosyl compound
946	Cl	CN	H	OH
947	Cl	CN	H	D-glucitol
948	Cl	CN	H	SO_3H
949	Cl	CN	H	PO_3H_2
950	Cl	CN	H	CHO
951	Cl	CN	H	COOH
952	Cl	CN	H	CH_2OH
953	Cl	CN	H	sugar
954	Cl	CN	H	C-glycosyl compound
955	Cl	CN	OH	OH
956	Cl	CN	OH	D-glucitol
957	Cl	CN	OH	SO_3H
958	Cl	CN	OH	PO_3H_2
959	Cl	CN	OH	CHO
960	Cl	CN	OH	COOH

961	Cl	CN	OH	CH_2OH
962	Cl	CN	OH	sugar
963	Cl	CN	OH	C-glycosyl compound
964	Cl	CN	CH_3	OH
965	Cl	CN	CH_3	D-glucitol
966	Cl	CN	CH_3	SO_3H
967	Cl	CN	CH_3	PO_3H_2
968	Cl	CN	CH_3	CHO
969	Cl	CN	CH_3	COOH
970	Cl	CN	CH_3	CH_2OH
971	Cl	CN	CH_3	sugar
972	Cl	CN	CH_3	C-glycosyl compound
973	Cl	CN	Cl	OH
974	Cl	CN	Cl	D-glucitol
975	Cl	CN	Cl	SO_3H
976	Cl	CN	Cl	PO_3H_2
977	Cl	CN	Cl	CHO
978	Cl	CN	Cl	COOH
979	Cl	CN	Cl	CH_2OH
980	Cl	CN	Cl	sugar
981	Cl	CN	Cl	C-glycosyl compound
982	Cl	CN	$B(OH)_2$	OH
983	Cl	CN	$B(OH)_2$	D-glucitol
984	Cl	CN	$B(OH)_2$	SO_3H
985	Cl	CN	$B(OH)_2$	PO_3H_2
986	Cl	CN	$B(OH)_2$	CHO
987	Cl	CN	$B(OH)_2$	COOH
988	Cl	CN	$B(OH)_2$	CH_2OH
989	Cl	CN	$B(OH)_2$	sugar
990	Cl	CN	$B(OH)_2$	C-glycosyl compound
991	Cl	CN	SH	OH
992	Cl	CN	SH	D-glucitol
993	Cl	CN	SH	SO_3H
994	Cl	CN	SH	PO_3H_2
995	Cl	CN	SH	CHO
996	Cl	CN	SH	COOH
997	Cl	CN	SH	CH_2OH

998	Cl	CN	SH	sugar
999	Cl	CN	SH	C-glycosyl compound
1000	Cl	CN	OCH_3	OH
1001	Cl	CN	OCH_3	D-glucitol
1002	Cl	CN	OCH_3	SO_3H
1003	Cl	CN	OCH_3	PO_3H_2
1004	Cl	CN	OCH_3	CHO
1005	Cl	CN	OCH_3	COOH
1006	Cl	CN	OCH_3	CH_2OH
1007	Cl	CN	OCH_3	sugar
1008	Cl	CN	OCH_3	C-glycosyl compound
1009	Cl	CH_3[a]	H	OH
1010	Cl	CH_3[a]	H	D-glucitol
1011	Cl	CH_3[a]	H	SO_3H
1012	Cl	CH_3[a]	H	PO_3H_2
1013	Cl	CH_3[a]	H	CHO
1014	Cl	CH_3[a]	H	COOH
1015	Cl	CH_3[a]	H	CH_2OH
1016	Cl	CH_3[a]	H	sugar
1017	Cl	CH_3[a]	H	C-glycosyl compound
1018	Cl	CH_3[a]	OH	OH
1019	Cl	CH_3[a]	OH	D-glucitol
1020	Cl	CH_3[a]	OH	SO_3H
1021	Cl	CH_3[a]	OH	PO_3H_2
1022	Cl	CH_3[a]	OH	CHO
1023	Cl	CH_3[a]	OH	COOH
1024	Cl	CH_3[a]	OH	CH_2OH
1025	Cl	CH_3[a]	OH	sugar
1026	Cl	CH_3[a]	OH	C-glycosyl compound
1027	Cl	CH_3[a]	CH_3	OH
1028	Cl	CH_3[a]	CH_3	D-glucitol
1029	Cl	CH_3[a]	CH_3	SO_3H
1030	Cl	CH_3[a]	CH_3	PO_3H_2
1031	Cl	CH_3[a]	CH_3	CHO

1032	Cl	CH_3[a]	CH_3	COOH
1033	Cl	CH_3[a]	CH_3	CH_2OH
1034	Cl	CH_3[a]	CH_3	sugar
1035	Cl	CH_3[a]	CH_3	C-glycosyl compound
1036	Cl	CH_3[a]	Cl	OH
1037	Cl	CH_3[a]	Cl	D-glucitol
1038	Cl	CH_3[a]	Cl	SO_3H
1039	Cl	CH_3[a]	Cl	PO_3H_2
1040	Cl	CH_3[a]	Cl	CHO
1041	Cl	CH_3[a]	Cl	COOH
1042	Cl	CH_3[a]	Cl	CH_2OH
1043	Cl	CH_3[a]	Cl	sugar
1044	Cl	CH_3[a]	Cl	C-glycosyl compound
1045	Cl	CH_3[a]	$B(OH)_2$	OH
1046	Cl	CH_3[a]	$B(OH)_2$	D-glucitol
1047	Cl	CH_3[a]	$B(OH)_2$	SO_3H
1048	Cl	CH_3[a]	$B(OH)_2$	PO_3H_2
1049	Cl	CH_3[a]	$B(OH)_2$	CHO
1050	Cl	CH_3[a]	$B(OH)_2$	COOH
1051	Cl	CH_3[a]	$B(OH)_2$	CH_2OH
1052	Cl	CH_3[a]	$B(OH)_2$	sugar
1053	Cl	CH_3[a]	$B(OH)_2$	C-glycosyl compound
1054	Cl	CH_3[a]	SH	OH
1055	Cl	CH_3[a]	SH	D-glucitol
1056	Cl	CH_3[a]	SH	SO_3H
1057	Cl	CH_3[a]	SH	PO_3H_2
1058	Cl	CH_3[a]	SH	CHO
1059	Cl	CH_3[a]	SH	COOH
1060	Cl	CH_3[a]	SH	CH_2OH
1061	Cl	CH_3[a]	SH	sugar
1062	Cl	CH_3[a]	SH	C-glycosyl compound
1063	Cl	CH_3[a]	OCH_3	OH

1064	Cl	CH_3[a]	OCH_3	D-glucitol
1065	Cl	CH_3[a]	OCH_3	SO_3H
1066	Cl	CH_3[a]	OCH_3	PO_3H_2
1067	Cl	CH_3[a]	OCH_3	CHO
1068	Cl	CH_3[a]	OCH_3	COOH
1069	Cl	CH_3[a]	OCH_3	CH_2OH
1070	Cl	CH_3[a]	OCH_3	sugar
1071	Cl	CH_3[a]	OCH_3	C-glycosyl compound
1072	Cl	OCH3[b]	H	OH
1073	Cl	OCH3[b]	H	D-glucitol
1074	Cl	OCH3[b]	H	SO_3H
1075	Cl	OCH3[b]	H	PO_3H_2
1076	Cl	OCH3[b]	H	CHO
1077	Cl	OCH3[b]	H	COOH
1078	Cl	OCH3[b]	H	CH_2OH
1079	Cl	OCH3[b]	H	sugar
1080	Cl	OCH3[b]	H	C-glycosyl compound
1081	Cl	OCH3[b]	OH	OH
1082	Cl	OCH3[b]	OH	D-glucitol
1083	Cl	OCH3[b]	OH	SO_3H
1084	Cl	OCH3[b]	OH	PO_3H_2
1085	Cl	OCH3[b]	OH	CHO
1086	Cl	OCH3[b]	OH	COOH
1087	Cl	OCH3[b]	OH	CH_2OH
1088	Cl	OCH3[b]	OH	sugar
1089	Cl	OCH3[b]	OH	C-glycosyl compound
1090	Cl	OCH3[b]	CH_3	OH
1091	Cl	OCH3[b]	CH_3	D-glucitol
1092	Cl	OCH3[b]	CH_3	SO_3H
1093	Cl	OCH3[b]	CH_3	PO_3H_2
1094	Cl	OCH3[b]	CH_3	CHO
1095	Cl	OCH3[b]	CH_3	COOH
1096	Cl	OCH3[b]	CH_3	CH_2OH

1097	Cl	OCH3[b]	CH_3	sugar
1098	Cl	OCH3[b]	CH_3	C-glycosyl compound
1099	Cl	OCH3[b]	Cl	OH
1100	Cl	OCH3[b]	Cl	D-glucitol
1101	Cl	OCH3[b]	Cl	SO_3H
1102	Cl	OCH3[b]	Cl	PO_3H_2
1103	Cl	OCH3[b]	Cl	CHO
1104	Cl	OCH3[b]	Cl	COOH
1105	Cl	OCH3[b]	Cl	CH_2OH
1106	Cl	OCH3[b]	Cl	sugar
1107	Cl	OCH3[b]	Cl	C-glycosyl compound
1108	Cl	OCH3[b]	$B(OH)_2$	OH
1109	Cl	OCH3[b]	$B(OH)_2$	D-glucitol
1110	Cl	OCH3[b]	$B(OH)_2$	SO_3H
1111	Cl	OCH3[b]	$B(OH)_2$	PO_3H_2
1112	Cl	OCH3[b]	$B(OH)_2$	CHO
1113	Cl	OCH3[b]	$B(OH)_2$	COOH
1114	Cl	OCH3[b]	$B(OH)_2$	CH_2OH
1115	Cl	OCH3[b]	$B(OH)_2$	sugar
1116	Cl	OCH3[b]	$B(OH)_2$	C-glycosyl compound
1117	Cl	OCH3[b]	SH	OH
1118	Cl	OCH3[b]	SH	D-glucitol
1119	Cl	OCH3[b]	SH	SO_3H
1120	Cl	OCH3[b]	SH	PO_3H_2
1121	Cl	OCH3[b]	SH	CHO
1122	Cl	OCH3[b]	SH	COOH
1123	Cl	OCH3[b]	SH	CH_2OH
1124	Cl	OCH3[b]	SH	sugar
1125	Cl	OCH3[b]	SH	C-glycosyl compound
1126	Cl	OCH3[b]	OCH_3	OH
1127	Cl	OCH3[b]	OCH_3	D-glucitol
1128	Cl	OCH3[b]	OCH_3	SO_3H
1129	Cl	OCH3[b]	OCH_3	PO_3H_2

1130	Cl	OCH3[b]	OCH_3	CHO
1131	Cl	OCH3[b]	OCH_3	COOH
1132	Cl	OCH3[b]	OCH_3	CH_2OH
1133	Cl	OCH3[b]	OCH_3	sugar
1134	Cl	OCH3[b]	OCH_3	C-glycosyl compound
1135	CN	H	H	OH
1136	CN	H	H	D-glucitol
1137	CN	H	H	SO_3H
1138	CN	H	H	PO_3H_2
1139	CN	H	H	CHO
1140	CN	H	H	COOH
1141	CN	H	H	CH_2OH
1142	CN	H	H	sugar
1143	CN	H	H	C-glycosyl compound
1144	CN	H	OH	OH
1145	CN	H	OH	D-glucitol
1146	CN	H	OH	SO_3H
1147	CN	H	OH	PO_3H_2
1148	CN	H	OH	CHO
1149	CN	H	OH	COOH
1150	CN	H	OH	CH_2OH
1151	CN	H	OH	sugar
1152	CN	H	OH	C-glycosyl compound
1153	CN	H	CH_3	OH
1154	CN	H	CH_3	D-glucitol
1155	CN	H	CH_3	SO_3H
1156	CN	H	CH_3	PO_3H_2
1157	CN	H	CH_3	CHO
1158	CN	H	CH_3	COOH
1159	CN	H	CH_3	CH_2OH
1160	CN	H	CH_3	sugar
1161	CN	H	CH_3	C-glycosyl compound
1162	CN	H	Cl	OH
1163	CN	H	Cl	D-glucitol
1164	CN	H	Cl	SO_3H
1165	CN	H	Cl	PO_3H_2
1166	CN	H	Cl	CHO

1167	CN	H	Cl	COOH
1168	CN	H	Cl	CH_2OH
1169	CN	H	Cl	sugar
1170	CN	H	Cl	C-glycosyl compound
1171	CN	H	$B(OH)_2$	OH
1172	CN	H	$B(OH)_2$	D-glucitol
1173	CN	H	$B(OH)_2$	SO_3H
1174	CN	H	$B(OH)_2$	PO_3H_2
1175	CN	H	$B(OH)_2$	CHO
1176	CN	H	$B(OH)_2$	COOH
1177	CN	H	$B(OH)_2$	CH_2OH
1178	CN	H	$B(OH)_2$	sugar
1179	CN	H	$B(OH)_2$	C-glycosyl compound
1180	CN	H	SH	OH
1181	CN	H	SH	D-glucitol
1182	CN	H	SH	SO_3H
1183	CN	H	SH	PO_3H_2
1184	CN	H	SH	CHO
1185	CN	H	SH	COOH
1186	CN	H	SH	CH_2OH
1187	CN	H	SH	sugar
1188	CN	H	SH	C-glycosyl compound
1189	CN	H	OCH_3	OH
1190	CN	H	OCH_3	D-glucitol
1191	CN	H	OCH_3	SO_3H
1192	CN	H	OCH_3	PO_3H_2
1193	CN	H	OCH_3	CHO
1194	CN	H	OCH_3	COOH
1195	CN	H	OCH_3	CH_2OH
1196	CN	H	OCH_3	sugar
1197	CN	H	OCH_3	C-glycosyl compound
1198	CN	F	H	OH
1199	CN	F	H	D-glucitol
1200	CN	F	H	SO_3H
1201	CN	F	H	PO_3H_2
1202	CN	F	H	CHO
1203	CN	F	H	COOH

1204	CN	F	H	CH_2OH
1205	CN	F	H	sugar
1206	CN	F	H	C-glycosyl compound
1207	CN	F	OH	OH
1208	CN	F	OH	D-glucitol
1209	CN	F	OH	SO_3H
1210	CN	F	OH	PO_3H_2
1211	CN	F	OH	CHO
1212	CN	F	OH	COOH
1213	CN	F	OH	CH_2OH
1214	CN	F	OH	sugar
1215	CN	F	OH	C-glycosyl compound
1216	CN	F	CH_3	OH
1217	CN	F	CH_3	D-glucitol
1218	CN	F	CH_3	SO_3H
1219	CN	F	CH_3	PO_3H_2
1220	CN	F	CH_3	CHO
1221	CN	F	CH_3	COOH
1222	CN	F	CH_3	CH_2OH
1223	CN	F	CH_3	sugar
1224	CN	F	CH_3	C-glycosyl compound
1225	CN	F	Cl	OH
1226	CN	F	Cl	D-glucitol
1227	CN	F	Cl	SO_3H
1228	CN	F	Cl	PO_3H_2
1229	CN	F	Cl	CHO
1230	CN	F	Cl	COOH
1231	CN	F	Cl	CH_2OH
1232	CN	F	Cl	sugar
1233	CN	F	Cl	C-glycosyl compound
1234	CN	F	$B(OH)_2$	OH
1235	CN	F	$B(OH)_2$	D-glucitol
1236	CN	F	$B(OH)_2$	SO_3H
1237	CN	F	$B(OH)_2$	PO_3H_2
1238	CN	F	$B(OH)_2$	CHO
1239	CN	F	$B(OH)_2$	COOH
1240	CN	F	$B(OH)_2$	CH_2OH

1241	CN	F	$B(OH)_2$	sugar
1242	CN	F	$B(OH)_2$	C-glycosyl compound
1243	CN	F	SH	OH
1244	CN	F	SH	D-glucitol
1245	CN	F	SH	SO_3H
1246	CN	F	SH	PO_3H_2
1247	CN	F	SH	CHO
1248	CN	F	SH	COOH
1249	CN	F	SH	CH_2OH
1250	CN	F	SH	sugar
1251	CN	F	SH	C-glycosyl compound
1252	CN	F	OCH_3	OH
1253	CN	F	OCH_3	D-glucitol
1254	CN	F	OCH_3	SO_3H
1255	CN	F	OCH_3	PO_3H_2
1256	CN	F	OCH_3	CHO
1257	CN	F	OCH_3	COOH
1258	CN	F	OCH_3	CH_2OH
1259	CN	F	OCH_3	sugar
1260	CN	F	OCH_3	C-glycosyl compound
1261	CN	Cl	H	OH
1262	CN	Cl	H	D-glucitol
1263	CN	Cl	H	SO_3H
1264	CN	Cl	H	PO_3H_2
1265	CN	Cl	H	CHO
1266	CN	Cl	H	COOH
1267	CN	Cl	H	CH_2OH
1268	CN	Cl	H	sugar
1269	CN	Cl	H	C-glycosyl compound
1270	CN	Cl	OH	OH
1271	CN	Cl	OH	D-glucitol
1272	CN	Cl	OH	SO_3H
1273	CN	Cl	OH	PO_3H_2
1274	CN	Cl	OH	CHO
1275	CN	Cl	OH	COOH
1276	CN	Cl	OH	CH_2OH
1277	CN	Cl	OH	sugar
1278	CN	Cl	OH	C-glycosyl compound

1279	CN	Cl	CH_3	OH
1280	CN	Cl	CH_3	D-glucitol
1281	CN	Cl	CH_3	SO_3H
1282	CN	Cl	CH_3	PO_3H_2
1283	CN	Cl	CH_3	CHO
1284	CN	Cl	CH_3	COOH
1285	CN	Cl	CH_3	CH_2OH
1286	CN	Cl	CH_3	sugar
1287	CN	Cl	CH_3	C-glycosyl compound
1288	CN	Cl	Cl	OH
1289	CN	Cl	Cl	D-glucitol
1290	CN	Cl	Cl	SO_3H
1291	CN	Cl	Cl	PO_3H_2
1292	CN	Cl	Cl	CHO
1293	CN	Cl	Cl	COOH
1294	CN	Cl	Cl	CH_2OH
1295	CN	Cl	Cl	sugar
1296	CN	Cl	Cl	C-glycosyl compound
1297	CN	Cl	$B(OH)_2$	OH
1298	CN	Cl	$B(OH)_2$	D-glucitol
1299	CN	Cl	$B(OH)_2$	SO_3H
1300	CN	Cl	$B(OH)_2$	PO_3H_2
1301	CN	Cl	$B(OH)_2$	CHO
1302	CN	Cl	$B(OH)_2$	COOH
1303	CN	Cl	$B(OH)_2$	CH_2OH
1304	CN	Cl	$B(OH)_2$	sugar
1305	CN	Cl	$B(OH)_2$	C-glycosyl compound
1306	CN	Cl	SH	OH
1307	CN	Cl	SH	D-glucitol
1308	CN	Cl	SH	SO_3H
1309	CN	Cl	SH	PO_3H_2
1310	CN	Cl	SH	CHO
1311	CN	Cl	SH	COOH
1312	CN	Cl	SH	CH_2OH
1313	CN	Cl	SH	sugar
1314	CN	Cl	SH	C-glycosyl compound
1315	CN	Cl	OCH_3	OH

1316	CN	Cl	OCH_3	D-glucitol
1317	CN	Cl	OCH_3	SO_3H
1318	CN	Cl	OCH_3	PO_3H_2
1319	CN	Cl	OCH_3	CHO
1320	CN	Cl	OCH_3	COOH
1321	CN	Cl	OCH_3	CH_2OH
1322	CN	Cl	OCH_3	sugar
1323	CN	Cl	OCH_3	C-glycosyl compound
1324	CN	CN	H	OH
1325	CN	CN	H	D-glucitol
1326	CN	CN	H	SO_3H
1327	CN	CN	H	PO_3H_2
1328	CN	CN	H	CHO
1329	CN	CN	H	COOH
1330	CN	CN	H	CH_2OH
1331	CN	CN	H	sugar
1332	CN	CN	H	C-glycosyl compound
1333	CN	CN	OH	OH
1334	CN	CN	OH	D-glucitol
1335	CN	CN	OH	SO_3H
1336	CN	CN	OH	PO_3H_2
1337	CN	CN	OH	CHO
1338	CN	CN	OH	COOH
1339	CN	CN	OH	CH_2OH
1340	CN	CN	OH	sugar
1341	CN	CN	OH	C-glycosyl compound
1342	CN	CN	CH_3	OH
1343	CN	CN	CH_3	D-glucitol
1344	CN	CN	CH_3	SO_3H
1345	CN	CN	CH_3	PO_3H_2
1346	CN	CN	CH_3	CHO
1347	CN	CN	CH_3	COOH
1348	CN	CN	CH_3	CH_2OH
1349	CN	CN	CH_3	sugar
1350	CN	CN	CH_3	C-glycosyl compound
1351	CN	CN	Cl	OH
1352	CN	CN	Cl	D-glucitol

1353	CN	CN	Cl	SO_3H
1354	CN	CN	Cl	PO_3H_2
1355	CN	CN	Cl	CHO
1356	CN	CN	Cl	COOH
1357	CN	CN	Cl	CH_2OH
1358	CN	CN	Cl	sugar
1359	CN	CN	Cl	C-glycosyl compound
1360	CN	CN	$B(OH)_2$	OH
1361	CN	CN	$B(OH)_2$	D-glucitol
1362	CN	CN	$B(OH)_2$	SO_3H
1363	CN	CN	$B(OH)_2$	PO_3H_2
1364	CN	CN	$B(OH)_2$	CHO
1365	CN	CN	$B(OH)_2$	COOH
1366	CN	CN	$B(OH)_2$	CH_2OH
1367	CN	CN	$B(OH)_2$	sugar
1368	CN	CN	$B(OH)_2$	C-glycosyl compound
1369	CN	CN	SH	OH
1370	CN	CN	SH	D-glucitol
1371	CN	CN	SH	SO_3H
1372	CN	CN	SH	PO_3H_2
1373	CN	CN	SH	CHO
1374	CN	CN	SH	COOH
1375	CN	CN	SH	CH_2OH
1376	CN	CN	SH	sugar
1377	CN	CN	SH	C-glycosyl compound
1378	CN	CN	OCH_3	OH
1379	CN	CN	OCH_3	D-glucitol
1380	CN	CN	OCH_3	SO_3H
1381	CN	CN	OCH_3	PO_3H_2
1382	CN	CN	OCH_3	CHO
1383	CN	CN	OCH_3	COOH
1384	CN	CN	OCH_3	CH_2OH
1385	CN	CN	OCH_3	sugar
1386	CN	CN	OCH_3	C-glycosyl compound
1387	CN	CH_3[a]	H	OH
1388	CN	CH_3[a]	H	D-glucitol

1389	CN	CH_3[a]	H	SO_3H
1390	CN	CH_3[a]	H	PO_3H_2
1391	CN	CH_3[a]	H	CHO
1392	CN	CH_3[a]	H	COOH
1393	CN	CH_3[a]	H	CH_2OH
1394	CN	CH_3[a]	H	sugar
1395	CN	CH_3[a]	H	C-glycosyl compound
1396	CN	CH_3[a]	OH	OH
1397	CN	CH_3[a]	OH	D-glucitol
1398	CN	CH_3[a]	OH	SO_3H
1399	CN	CH_3[a]	OH	PO_3H_2
1400	CN	CH_3[a]	OH	CHO
1401	CN	CH_3[a]	OH	COOH
1402	CN	CH_3[a]	OH	CH_2OH
1403	CN	CH_3[a]	OH	sugar
1404	CN	CH_3[a]	OH	C-glycosyl compound
1405	CN	CH_3[a]	CH_3	OH
1406	CN	CH_3[a]	CH_3	D-glucitol
1407	CN	CH_3[a]	CH_3	SO_3H
1408	CN	CH_3[a]	CH_3	PO_3H_2
1409	CN	CH_3[a]	CH_3	CHO
1410	CN	CH_3[a]	CH_3	COOH
1411	CN	CH_3[a]	CH_3	CH_2OH
1412	CN	CH_3[a]	CH_3	sugar
1413	CN	CH_3[a]	CH_3	C-glycosyl compound
1414	CN	CH_3[a]	Cl	OH
1415	CN	CH_3[a]	Cl	D-glucitol
1416	CN	CH_3[a]	Cl	SO_3H
1417	CN	CH_3[a]	Cl	PO_3H_2
1418	CN	CH_3[a]	Cl	CHO
1419	CN	CH_3[a]	Cl	COOH
1420	CN	CH_3[a]	Cl	CH_2OH

1421	CN	CH_3[a]	Cl	sugar
1422	CN	CH_3[a]	Cl	C-glycosyl compound
1423	CN	CH_3[a]	$B(OH)_2$	OH
1424	CN	CH_3[a]	$B(OH)_2$	D-glucitol
1425	CN	CH_3[a]	$B(OH)_2$	SO_3H
1426	CN	CH_3[a]	$B(OH)_2$	PO_3H_2
1427	CN	CH_3[a]	$B(OH)_2$	CHO
1428	CN	CH_3[a]	$B(OH)_2$	COOH
1429	CN	CH_3[a]	$B(OH)_2$	CH_2OH
1430	CN	CH_3[a]	$B(OH)_2$	sugar
1431	CN	CH_3[a]	$B(OH)_2$	C-glycosyl compound
1432	CN	CH_3[a]	SH	OH
1433	CN	CH_3[a]	SH	D-glucitol
1434	CN	CH_3[a]	SH	SO_3H
1435	CN	CH_3[a]	SH	PO_3H_2
1436	CN	CH_3[a]	SH	CHO
1437	CN	CH_3[a]	SH	COOH
1438	CN	CH_3[a]	SH	CH_2OH
1439	CN	CH_3[a]	SH	sugar
1440	CN	CH_3[a]	SH	C-glycosyl compound
1441	CN	CH_3[a]	OCH_3	OH
1442	CN	CH_3[a]	OCH_3	D-glucitol
1443	CN	CH_3[a]	OCH_3	SO_3H
1444	CN	CH_3[a]	OCH_3	PO_3H_2
1445	CN	CH_3[a]	OCH_3	CHO
1446	CN	CH_3[a]	OCH_3	COOH
1447	CN	CH_3[a]	OCH_3	CH_2OH
1448	CN	CH_3[a]	OCH_3	sugar
1449	CN	CH_3[a]	OCH_3	C-glycosyl compound
1450	CN	OCH3[b]	H	OH
1451	CN	OCH3[b]	H	D-glucitol
1452	CN	OCH3[b]	H	SO_3H
1453	CN	OCH3[b]	H	PO_3H_2

1454	CN	$OCH3^b$	H	CHO
1455	CN	$OCH3^b$	H	COOH
1456	CN	$OCH3^b$	H	CH_2OH
1457	CN	$OCH3^b$	H	sugar
1458	CN	$OCH3^b$	H	C-glycosyl compound
1459	CN	$OCH3^b$	OH	OH
1460	CN	$OCH3^b$	OH	D-glucitol
1461	CN	$OCH3^b$	OH	SO_3H
1462	CN	$OCH3^b$	OH	PO_3H_2
1463	CN	$OCH3^b$	OH	CHO
1464	CN	$OCH3^b$	OH	COOH
1465	CN	$OCH3^b$	OH	CH_2OH
1466	CN	$OCH3^b$	OH	sugar
1467	CN	$OCH3^b$	OH	C-glycosyl compound
1468	CN	$OCH3^b$	CH_3	OH
1469	CN	$OCH3^b$	CH_3	D-glucitol
1470	CN	$OCH3^b$	CH_3	SO_3H
1471	CN	$OCH3^b$	CH_3	PO_3H_2
1472	CN	$OCH3^b$	CH_3	CHO
1473	CN	$OCH3^b$	CH_3	COOH
1474	CN	$OCH3^b$	CH_3	CH_2OH
1475	CN	$OCH3^b$	CH_3	sugar
1476	CN	$OCH3^b$	CH_3	C-glycosyl compound
1477	CN	$OCH3^b$	Cl	OH
1478	CN	$OCH3^b$	Cl	D-glucitol
1479	CN	$OCH3^b$	Cl	SO_3H
1480	CN	$OCH3^b$	Cl	PO_3H_2
1481	CN	$OCH3^b$	Cl	CHO
1482	CN	$OCH3^b$	Cl	COOH
1483	CN	$OCH3^b$	Cl	CH_2OH
1484	CN	$OCH3^b$	Cl	sugar
1485	CN	$OCH3^b$	Cl	C-glycosyl compound
1486	CN	$OCH3^b$	$B(OH)_2$	OH
1487	CN	$OCH3^b$	$B(OH)_2$	D-glucitol

1488	CN	OCH3[b]	$B(OH)_2$	SO_3H
1489	CN	OCH3[b]	$B(OH)_2$	PO_3H_2
1490	CN	OCH3[b]	$B(OH)_2$	CHO
1491	CN	OCH3[b]	$B(OH)_2$	COOH
1492	CN	OCH3[b]	$B(OH)_2$	CH_2OH
1493	CN	OCH3[b]	$B(OH)_2$	sugar
1494	CN	OCH3[b]	$B(OH)_2$	C-glycosyl compound
1495	CN	OCH3[b]	SH	OH
1496	CN	OCH3[b]	SH	D-glucitol
1497	CN	OCH3[b]	SH	SO_3H
1498	CN	OCH3[b]	SH	PO_3H_2
1499	CN	OCH3[b]	SH	CHO
1500	CN	OCH3[b]	SH	COOH
1501	CN	OCH3[b]	SH	CH_2OH
1502	CN	OCH3[b]	SH	sugar
1503	CN	OCH3[b]	SH	C-glycosyl compound
1504	CN	OCH3[b]	OCH_3	OH
1505	CN	OCH3[b]	OCH_3	D-glucitol
1506	CN	OCH3[b]	OCH_3	SO_3H
1507	CN	OCH3[b]	OCH_3	PO_3H_2
1508	CN	OCH3[b]	OCH_3	CHO
1509	CN	OCH3[b]	OCH_3	COOH
1510	CN	OCH3[b]	OCH_3	CH_2OH
1511	CN	OCH3[b]	OCH_3	sugar
1512	CN	OCH3[b]	OCH_3	C-glycosyl compound
1513	CH_3[a]	H	H	OH
1514	CH_3[a]	H	H	D-glucitol
1515	CH_3[a]	H	H	SO_3H
1516	CH_3[a]	H	H	PO_3H_2
1517	CH_3[a]	H	H	CHO
1518	CH_3[a]	H	H	COOH
1519	CH_3[a]	H	H	CH_2OH
1520	CH_3[a]	H	H	sugar

1521	CH_3[a]	H	H	C-glycosyl compound
1522	CH_3[a]	H	OH	OH
1523	CH_3[a]	H	OH	D-glucitol
1524	CH_3[a]	H	OH	SO_3H
1525	CH_3[a]	H	OH	PO_3H_2
1526	CH_3[a]	H	OH	CHO
1527	CH_3[a]	H	OH	COOH
1528	CH_3[a]	H	OH	CH_2OH
1529	CH_3[a]	H	OH	sugar
1530	CH_3[a]	H	OH	C-glycosyl compound
1531	CH_3[a]	H	CH_3	OH
1532	CH_3[a]	H	CH_3	D-glucitol
1533	CH_3[a]	H	CH_3	SO_3H
1534	CH_3[a]	H	CH_3	PO_3H_2
1535	CH_3[a]	H	CH_3	CHO
1536	CH_3[a]	H	CH_3	COOH
1537	CH_3[a]	H	CH_3	CH_2OH
1538	CH_3[a]	H	CH_3	sugar
1539	CH_3[a]	H	CH_3	C-glycosyl compound
1540	CH_3[a]	H	Cl	OH
1541	CH_3[a]	H	Cl	D-glucitol
1542	CH_3[a]	H	Cl	SO_3H
1543	CH_3[a]	H	Cl	PO_3H_2
1544	CH_3[a]	H	Cl	CHO
1545	CH_3[a]	H	Cl	COOH
1546	CH_3[a]	H	Cl	CH_2OH
1547	CH_3[a]	H	Cl	sugar
1548	CH_3[a]	H	Cl	C-glycosyl compound
1549	CH_3[a]	H	$B(OH)_2$	OH
1550	CH_3[a]	H	$B(OH)_2$	D-glucitol
1551	CH_3[a]	H	$B(OH)_2$	SO_3H
1552	CH_3[a]	H	$B(OH)_2$	PO_3H_2

1553	CH_3[a]	H	$B(OH)_2$	CHO
1554	CH_3[a]	H	$B(OH)_2$	COOH
1555	CH_3[a]	H	$B(OH)_2$	CH_2OH
1556	CH_3[a]	H	$B(OH)_2$	sugar
1557	CH_3[a]	H	$B(OH)_2$	C-glycosyl compound
1558	CH_3[a]	H	SH	OH
1559	CH_3[a]	H	SH	D-glucitol
1560	CH_3[a]	H	SH	SO_3H
1561	CH_3[a]	H	SH	PO_3H_2
1562	CH_3[a]	H	SH	CHO
1563	CH_3[a]	H	SH	COOH
1564	CH_3[a]	H	SH	CH_2OH
1565	CH_3[a]	H	SH	sugar
1566	CH_3[a]	H	SH	C-glycosyl compound
1567	CH_3[a]	H	OCH_3	OH
1568	CH_3[a]	H	OCH_3	D-glucitol
1569	CH_3[a]	H	OCH_3	SO_3H
1570	CH_3[a]	H	OCH_3	PO_3H_2
1571	CH_3[a]	H	OCH_3	CHO
1572	CH_3[a]	H	OCH_3	COOH
1573	CH_3[a]	H	OCH_3	CH_2OH
1574	CH_3[a]	H	OCH_3	sugar
1575	CH_3[a]	H	OCH_3	C-glycosyl compound
1576	CH_3[a]	F	H	OH
1577	CH_3[a]	F	H	D-glucitol
1578	CH_3[a]	F	H	SO_3H
1579	CH_3[a]	F	H	PO_3H_2
1580	CH_3[a]	F	H	CHO
1581	CH_3[a]	F	H	COOH
1582	CH_3[a]	F	H	CH_2OH
1583	CH_3[a]	F	H	sugar
1584	CH_3[a]	F	H	C-glycosyl compound

1585	CH_3[a]	F	OH	OH
1586	CH_3[a]	F	OH	D-glucitol
1587	CH_3[a]	F	OH	SO_3H
1588	CH_3[a]	F	OH	PO_3H_2
1589	CH_3[a]	F	OH	CHO
1590	CH_3[a]	F	OH	COOH
1591	CH_3[a]	F	OH	CH_2OH
1592	CH_3[a]	F	OH	sugar
1593	CH_3[a]	F	OH	C-glycosyl compound
1594	CH_3[a]	F	CH_3	OH
1595	CH_3[a]	F	CH_3	D-glucitol
1596	CH_3[a]	F	CH_3	SO_3H
1597	CH_3[a]	F	CH_3	PO_3H_2
1598	CH_3[a]	F	CH_3	CHO
1599	CH_3[a]	F	CH_3	COOH
1600	CH_3[a]	F	CH_3	CH_2OH
1601	CH_3[a]	F	CH_3	sugar
1602	CH_3[a]	F	CH_3	C-glycosyl compound
1603	CH_3[a]	F	Cl	OH
1604	CH_3[a]	F	Cl	D-glucitol
1605	CH_3[a]	F	Cl	SO_3H
1606	CH_3[a]	F	Cl	PO_3H_2
1607	CH_3[a]	F	Cl	CHO
1608	CH_3[a]	F	Cl	COOH
1609	CH_3[a]	F	Cl	CH_2OH
1610	CH_3[a]	F	Cl	sugar
1611	CH_3[a]	F	Cl	C-glycosyl compound
1612	CH_3[a]	F	$B(OH)_2$	OH
1613	CH_3[a]	F	$B(OH)_2$	D-glucitol
1614	CH_3[a]	F	$B(OH)_2$	SO_3H
1615	CH_3[a]	F	$B(OH)_2$	PO_3H_2
1616	CH_3[a]	F	$B(OH)_2$	CHO

1617	CH_3[a]	F	$B(OH)_2$	COOH
1618	CH_3[a]	F	$B(OH)_2$	CH_2OH
1619	CH_3[a]	F	$B(OH)_2$	sugar
1620	CH_3[a]	F	$B(OH)_2$	C-glycosyl compound
1621	CH_3[a]	F	SH	OH
1622	CH_3[a]	F	SH	D-glucitol
1623	CH_3[a]	F	SH	SO_3H
1624	CH_3[a]	F	SH	PO_3H_2
1625	CH_3[a]	F	SH	CHO
1626	CH_3[a]	F	SH	COOH
1627	CH_3[a]	F	SH	CH_2OH
1628	CH_3[a]	F	SH	sugar
1629	CH_3[a]	F	SH	C-glycosyl compound
1630	CH_3[a]	F	OCH_3	OH
1631	CH_3[a]	F	OCH_3	D-glucitol
1632	CH_3[a]	F	OCH_3	SO_3H
1633	CH_3[a]	F	OCH_3	PO_3H_2
1634	CH_3[a]	F	OCH_3	CHO
1635	CH_3[a]	F	OCH_3	COOH
1636	CH_3[a]	F	OCH_3	CH_2OH
1637	CH_3[a]	F	OCH_3	sugar
1638	CH_3[a]	F	OCH_3	C-glycosyl compound
1639	CH_3[a]	Cl	H	OH
1640	CH_3[a]	Cl	H	D-glucitol
1641	CH_3[a]	Cl	H	SO_3H
1642	CH_3[a]	Cl	H	PO_3H_2
1643	CH_3[a]	Cl	H	CHO
1644	CH_3[a]	Cl	H	COOH
1645	CH_3[a]	Cl	H	CH_2OH
1646	CH_3[a]	Cl	H	sugar
1647	CH_3[a]	Cl	H	C-glycosyl compound
1648	CH_3[a]	Cl	OH	OH

1649	CH_3[a]	Cl	OH	D-glucitol
1650	CH_3[a]	Cl	OH	SO_3H
1651	CH_3[a]	Cl	OH	PO_3H_2
1652	CH_3[a]	Cl	OH	CHO
1653	CH_3[a]	Cl	OH	COOH
1654	CH_3[a]	Cl	OH	CH_2OH
1655	CH_3[a]	Cl	OH	sugar
1656	CH_3[a]	Cl	OH	C-glycosyl compound
1657	CH_3[a]	Cl	CH_3	OH
1658	CH_3[a]	Cl	CH_3	D-glucitol
1659	CH_3[a]	Cl	CH_3	SO_3H
1660	CH_3[a]	Cl	CH_3	PO_3H_2
1661	CH_3[a]	Cl	CH_3	CHO
1662	CH_3[a]	Cl	CH_3	COOH
1663	CH_3[a]	Cl	CH_3	CH_2OH
1664	CH_3[a]	Cl	CH_3	sugar
1665	CH_3[a]	Cl	CH_3	C-glycosyl compound
1666	CH_3[a]	Cl	Cl	OH
1667	CH_3[a]	Cl	Cl	D-glucitol
1668	CH_3[a]	Cl	Cl	SO_3H
1669	CH_3[a]	Cl	Cl	PO_3H_2
1670	CH_3[a]	Cl	Cl	CHO
1671	CH_3[a]	Cl	Cl	COOH
1672	CH_3[a]	Cl	Cl	CH_2OH
1673	CH_3[a]	Cl	Cl	sugar
1674	CH_3[a]	Cl	Cl	C-glycosyl compound
1675	CH_3[a]	Cl	$B(OH)_2$	OH
1676	CH_3[a]	Cl	$B(OH)_2$	D-glucitol
1677	CH_3[a]	Cl	$B(OH)_2$	SO_3H
1678	CH_3[a]	Cl	$B(OH)_2$	PO_3H_2
1679	CH_3[a]	Cl	$B(OH)_2$	CHO
1680	CH_3[a]	Cl	$B(OH)_2$	COOH

1681	CH_3[a]	Cl	$B(OH)_2$	CH_2OH
1682	CH_3[a]	Cl	$B(OH)_2$	sugar
1683	CH_3[a]	Cl	$B(OH)_2$	C-glycosyl compound
1684	CH_3[a]	Cl	SH	OH
1685	CH_3[a]	Cl	SH	D-glucitol
1686	CH_3[a]	Cl	SH	SO_3H
1687	CH_3[a]	Cl	SH	PO_3H_2
1688	CH_3[a]	Cl	SH	CHO
1689	CH_3[a]	Cl	SH	COOH
1690	CH_3[a]	Cl	SH	CH_2OH
1691	CH_3[a]	Cl	SH	sugar
1692	CH_3[a]	Cl	SH	C-glycosyl compound
1693	CH_3[a]	Cl	OCH_3	OH
1694	CH_3[a]	Cl	OCH_3	D-glucitol
1695	CH_3[a]	Cl	OCH_3	SO_3H
1696	CH_3[a]	Cl	OCH_3	PO_3H_2
1697	CH_3[a]	Cl	OCH_3	CHO
1698	CH_3[a]	Cl	OCH_3	COOH
1699	CH_3[a]	Cl	OCH_3	CH_2OH
1700	CH_3[a]	Cl	OCH_3	sugar
1701	CH_3[a]	Cl	OCH_3	C-glycosyl compound
1702	CH_3[a]	CN	H	OH
1703	CH_3[a]	CN	H	D-glucitol
1704	CH_3[a]	CN	H	SO_3H
1705	CH_3[a]	CN	H	PO_3H_2
1706	CH_3[a]	CN	H	CHO
1707	CH_3[a]	CN	H	COOH
1708	CH_3[a]	CN	H	CH_2OH
1709	CH_3[a]	CN	H	sugar
1710	CH_3[a]	CN	H	C-glycosyl compound
1711	CH_3[a]	CN	OH	OH
1712	CH_3[a]	CN	OH	D-glucitol

1713	CH_3[a]	CN	OH	SO_3H
1714	CH_3[a]	CN	OH	PO_3H_2
1715	CH_3[a]	CN	OH	CHO
1716	CH_3[a]	CN	OH	COOH
1717	CH_3[a]	CN	OH	CH_2OH
1718	CH_3[a]	CN	OH	sugar
1719	CH_3[a]	CN	OH	C-glycosyl compound
1720	CH_3[a]	CN	CH_3	OH
1721	CH_3[a]	CN	CH_3	D-glucitol
1722	CH_3[a]	CN	CH_3	SO_3H
1723	CH_3[a]	CN	CH_3	PO_3H_2
1724	CH_3[a]	CN	CH_3	CHO
1725	CH_3[a]	CN	CH_3	COOH
1726	CH_3[a]	CN	CH_3	CH_2OH
1727	CH_3[a]	CN	CH_3	sugar
1728	CH_3[a]	CN	CH_3	C-glycosyl compound
1729	CH_3[a]	CN	Cl	OH
1730	CH_3[a]	CN	Cl	D-glucitol
1731	CH_3[a]	CN	Cl	SO_3H
1732	CH_3[a]	CN	Cl	PO_3H_2
1733	CH_3[a]	CN	Cl	CHO
1734	CH_3[a]	CN	Cl	COOH
1735	CH_3[a]	CN	Cl	CH_2OH
1736	CH_3[a]	CN	Cl	sugar
1737	CH_3[a]	CN	Cl	C-glycosyl compound
1738	CH_3[a]	CN	$B(OH)_2$	OH
1739	CH_3[a]	CN	$B(OH)_2$	D-glucitol
1740	CH_3[a]	CN	$B(OH)_2$	SO_3H
1741	CH_3[a]	CN	$B(OH)_2$	PO_3H_2
1742	CH_3[a]	CN	$B(OH)_2$	CHO
1743	CH_3[a]	CN	$B(OH)_2$	COOH
1744	CH_3[a]	CN	$B(OH)_2$	CH_2OH

1745	CH_3[a]	CN	$B(OH)_2$	sugar
1746	CH_3[a]	CN	$B(OH)_2$	C-glycosyl compound
1747	CH_3[a]	CN	SH	OH
1748	CH_3[a]	CN	SH	D-glucitol
1749	CH_3[a]	CN	SH	SO_3H
1750	CH_3[a]	CN	SH	PO_3H_2
1751	CH_3[a]	CN	SH	CHO
1752	CH_3[a]	CN	SH	COOH
1753	CH_3[a]	CN	SH	CH_2OH
1754	CH_3[a]	CN	SH	sugar
1755	CH_3[a]	CN	SH	C-glycosyl compound
1756	CH_3[a]	CN	OCH_3	OH
1757	CH_3[a]	CN	OCH_3	D-glucitol
1758	CH_3[a]	CN	OCH_3	SO_3H
1759	CH_3[a]	CN	OCH_3	PO_3H_2
1760	CH_3[a]	CN	OCH_3	CHO
1761	CH_3[a]	CN	OCH_3	COOH
1762	CH_3[a]	CN	OCH_3	CH_2OH
1763	CH_3[a]	CN	OCH_3	sugar
1764	CH_3[a]	CN	OCH_3	C-glycosyl compound
1765	CH_3[a]	CH_3[a]	H	OH
1766	CH_3[a]	CH_3[a]	H	D-glucitol
1767	CH_3[a]	CH_3[a]	H	SO_3H
1768	CH_3[a]	CH_3[a]	H	PO_3H_2
1769	CH_3[a]	CH_3[a]	H	CHO
1770	CH_3[a]	CH_3[a]	H	COOH
1771	CH_3[a]	CH_3[a]	H	CH_2OH
1772	CH_3[a]	CH_3[a]	H	sugar
1773	CH_3[a]	CH_3[a]	H	C-glycosyl compound
1774	CH_3[a]	CH_3[a]	OH	OH
1775	CH_3[a]	CH_3[a]	OH	D-glucitol
1776	CH_3[a]	CH_3[a]	OH	SO_3H

1777	CH_3[a]	CH_3[a]	OH	PO_3H_2
1778	CH_3[a]	CH_3[a]	OH	CHO
1779	CH_3[a]	CH_3[a]	OH	COOH
1780	CH_3[a]	CH_3[a]	OH	CH_2OH
1781	CH_3[a]	CH_3[a]	OH	sugar
1782	CH_3[a]	CH_3[a]	OH	C-glycosyl compound
1783	CH_3[a]	CH_3[a]	CH_3	OH
1784	CH_3[a]	CH_3[a]	CH_3	D-glucitol
1785	CH_3[a]	CH_3[a]	CH_3	SO_3H
1786	CH_3[a]	CH_3[a]	CH_3	PO_3H_2
1787	CH_3[a]	CH_3[a]	CH_3	CHO
1788	CH_3[a]	CH_3[a]	CH_3	COOH
1789	CH_3[a]	CH_3[a]	CH_3	CH_2OH
1790	CH_3[a]	CH_3[a]	CH_3	sugar
1791	CH_3[a]	CH_3[a]	CH_3	C-glycosyl compound
1792	CH_3[a]	CH_3[a]	Cl	OH
1793	CH_3[a]	CH_3[a]	Cl	D-glucitol
1794	CH_3[a]	CH_3[a]	Cl	SO_3H
1795	CH_3[a]	CH_3[a]	Cl	PO_3H_2
1796	CH_3[a]	CH_3[a]	Cl	CHO
1797	CH_3[a]	CH_3[a]	Cl	COOH
1798	CH_3[a]	CH_3[a]	Cl	CH_2OH
1799	CH_3[a]	CH_3[a]	Cl	sugar
1800	CH_3[a]	CH_3[a]	Cl	C-glycosyl compound
1801	CH_3[a]	CH_3[a]	$B(OH)_2$	OH
1802	CH_3[a]	CH_3[a]	$B(OH)_2$	D-glucitol
1803	CH_3[a]	CH_3[a]	$B(OH)_2$	SO_3H
1804	CH_3[a]	CH_3[a]	$B(OH)_2$	PO_3H_2
1805	CH_3[a]	CH_3[a]	$B(OH)_2$	CHO
1806	CH_3[a]	CH_3[a]	$B(OH)_2$	COOH
1807	CH_3[a]	CH_3[a]	$B(OH)_2$	CH_2OH
1808	CH_3[a]	CH_3[a]	$B(OH)_2$	sugar

1809	CH_3[a]	CH_3[a]	$B(OH)_2$	C-glycosyl compound
1810	CH_3[a]	CH_3[a]	SH	OH
1811	CH_3[a]	CH_3[a]	SH	D-glucitol
1812	CH_3[a]	CH_3[a]	SH	SO_3H
1813	CH_3[a]	CH_3[a]	SH	PO_3H_2
1814	CH_3[a]	CH_3[a]	SH	CHO
1815	CH_3[a]	CH_3[a]	SH	COOH
1816	CH_3[a]	CH_3[a]	SH	CH_2OH
1817	CH_3[a]	CH_3[a]	SH	sugar
1818	CH_3[a]	CH_3[a]	SH	C-glycosyl compound
1819	CH_3[a]	CH_3[a]	OCH_3	OH
1820	CH_3[a]	CH_3[a]	OCH_3	D-glucitol
1821	CH_3[a]	CH_3[a]	OCH_3	SO_3H
1822	CH_3[a]	CH_3[a]	OCH_3	PO_3H_2
1823	CH_3[a]	CH_3[a]	OCH_3	CHO
1824	CH_3[a]	CH_3[a]	OCH_3	COOH
1825	CH_3[a]	CH_3[a]	OCH_3	CH_2OH
1826	CH_3[a]	CH_3[a]	OCH_3	sugar
1827	CH_3[a]	CH_3[a]	OCH_3	C-glycosyl compound
1828	CH_3[a]	OCH3[b]	H	OH
1829	CH_3[a]	OCH3[b]	H	D-glucitol
1830	CH_3[a]	OCH3[b]	H	SO_3H
1831	CH_3[a]	OCH3[b]	H	PO_3H_2
1832	CH_3[a]	OCH3[b]	H	CHO
1833	CH_3[a]	OCH3[b]	H	COOH
1834	CH_3[a]	OCH3[b]	H	CH_2OH
1835	CH_3[a]	OCH3[b]	H	sugar
1836	CH_3[a]	OCH3[b]	H	C-glycosyl compound
1837	CH_3[a]	OCH3[b]	OH	OH
1838	CH_3[a]	OCH3[b]	OH	D-glucitol
1839	CH_3[a]	OCH3[b]	OH	SO_3H
1840	CH_3[a]	OCH3[b]	OH	PO_3H_2

1841	CH_3[a]	OCH3[b]	OH	CHO
1842	CH_3[a]	OCH3[b]	OH	COOH
1843	CH_3[a]	OCH3[b]	OH	CH_2OH
1844	CH_3[a]	OCH3[b]	OH	sugar
1845	CH_3[a]	OCH3[b]	OH	C-glycosyl compound
1846	CH_3[a]	OCH3[b]	CH_3	OH
1847	CH_3[a]	OCH3[b]	CH_3	D-glucitol
1848	CH_3[a]	OCH3[b]	CH_3	SO_3H
1849	CH_3[a]	OCH3[b]	CH_3	PO_3H_2
1850	CH_3[a]	OCH3[b]	CH_3	CHO
1851	CH_3[a]	OCH3[b]	CH_3	COOH
1852	CH_3[a]	OCH3[b]	CH_3	CH_2OH
1853	CH_3[a]	OCH3[b]	CH_3	sugar
1854	CH_3[a]	OCH3[b]	CH_3	C-glycosyl compound
1855	CH_3[a]	OCH3[b]	Cl	OH
1856	CH_3[a]	OCH3[b]	Cl	D-glucitol
1857	CH_3[a]	OCH3[b]	Cl	SO_3H
1858	CH_3[a]	OCH3[b]	Cl	PO_3H_2
1859	CH_3[a]	OCH3[b]	Cl	CHO
1860	CH_3[a]	OCH3[b]	Cl	COOH
1861	CH_3[a]	OCH3[b]	Cl	CH_2OH
1862	CH_3[a]	OCH3[b]	Cl	sugar
1863	CH_3[a]	OCH3[b]	Cl	C-glycosyl compound
1864	CH_3[a]	OCH3[b]	$B(OH)_2$	OH
1865	CH_3[a]	OCH3[b]	$B(OH)_2$	D-glucitol
1866	CH_3[a]	OCH3[b]	$B(OH)_2$	SO_3H
1867	CH_3[a]	OCH3[b]	$B(OH)_2$	PO_3H_2
1868	CH_3[a]	OCH3[b]	$B(OH)_2$	CHO
1869	CH_3[a]	OCH3[b]	$B(OH)_2$	COOH
1870	CH_3[a]	OCH3[b]	$B(OH)_2$	CH_2OH
1871	CH_3[a]	OCH3[b]	$B(OH)_2$	sugar
1872	CH_3[a]	OCH3[b]	$B(OH)_2$	C-glycosyl compound

1873	CH_3[a]	OCH3[b]	SH	OH
1874	CH_3[a]	OCH3[b]	SH	D-glucitol
1875	CH_3[a]	OCH3[b]	SH	SO_3H
1876	CH_3[a]	OCH3[b]	SH	PO_3H_2
1877	CH_3[a]	OCH3[b]	SH	CHO
1878	CH_3[a]	OCH3[b]	SH	COOH
1879	CH_3[a]	OCH3[b]	SH	CH_2OH
1880	CH_3[a]	OCH3[b]	SH	sugar
1881	CH_3[a]	OCH3[b]	SH	C-glycosyl compound
1882	CH_3[a]	OCH3[b]	OCH_3	OH
1883	CH_3[a]	OCH3[b]	OCH_3	D-glucitol
1884	CH_3[a]	OCH3[b]	OCH_3	SO_3H
1885	CH_3[a]	OCH3[b]	OCH_3	PO_3H_2
1886	CH_3[a]	OCH3[b]	OCH_3	CHO
1887	CH_3[a]	OCH3[b]	OCH_3	COOH
1888	CH_3[a]	OCH3[b]	OCH_3	CH_2OH
1889	CH_3[a]	OCH3[b]	OCH_3	sugar
1890	CH_3[a]	OCH3[b]	OCH_3	C-glycosyl compound
1891	OCH3[b]	H	H	OH
1892	OCH3[b]	H	H	D-glucitol
1893	OCH3[b]	H	H	SO_3H
1894	OCH3[b]	H	H	PO_3H_2
1895	OCH3[b]	H	H	CHO
1896	OCH3[b]	H	H	COOH
1897	OCH3[b]	H	H	CH_2OH
1898	OCH3[b]	H	H	sugar
1899	OCH3[b]	H	H	C-glycosyl compound
1900	OCH3[b]	H	OH	OH
1901	OCH3[b]	H	OH	D-glucitol
1902	OCH3[b]	H	OH	SO_3H
1903	OCH3[b]	H	OH	PO_3H_2
1904	OCH3[b]	H	OH	CHO
1905	OCH3[b]	H	OH	COOH

1906	$OCH3^b$	H	OH	CH_2OH
1907	$OCH3^b$	H	OH	sugar
1908	$OCH3^b$	H	OH	C-glycosyl compound
1909	$OCH3^b$	H	CH3	OH
1910	$OCH3^b$	H	CH3	D-glucitol
1911	$OCH3^b$	H	CH3	SO_3H
1912	$OCH3^b$	H	CH3	PO_3H_2
1913	$OCH3^b$	H	CH3	CHO
1914	$OCH3^b$	H	CH3	COOH
1915	$OCH3^b$	H	CH3	CH_2OH
1916	$OCH3^b$	H	CH3	sugar
1917	$OCH3^b$	H	CH3	C-glycosyl compound
1918	$OCH3^b$	H	Cl	OH
1919	$OCH3^b$	H	Cl	D-glucitol
1920	$OCH3^b$	H	Cl	SO_3H
1921	$OCH3^b$	H	Cl	PO_3H_2
1922	$OCH3^b$	H	Cl	CHO
1923	$OCH3^b$	H	Cl	COOH
1924	$OCH3^b$	H	Cl	CH_2OH
1925	$OCH3^b$	H	Cl	sugar
1926	$OCH3^b$	H	Cl	C-glycosyl compound
1927	$OCH3^b$	H	$B(OH)_2$	OH
1928	$OCH3^b$	H	$B(OH)_2$	D-glucitol
1929	$OCH3^b$	H	$B(OH)_2$	SO_3H
1930	$OCH3^b$	H	$B(OH)_2$	PO_3H_2
1931	$OCH3^b$	H	$B(OH)_2$	CHO
1932	$OCH3^b$	H	$B(OH)_2$	COOH
1933	$OCH3^b$	H	$B(OH)_2$	CH_2OH
1934	$OCH3^b$	H	$B(OH)_2$	sugar
1935	$OCH3^b$	H	$B(OH)_2$	C-glycosyl compound
1936	$OCH3^b$	H	SH	OH
1937	$OCH3^b$	H	SH	D-glucitol
1938	$OCH3^b$	H	SH	SO_3H
1939	$OCH3^b$	H	SH	PO_3H_2

1940	$OCH3^b$	H	SH	CHO
1941	$OCH3^b$	H	SH	COOH
1942	$OCH3^b$	H	SH	CH_2OH
1943	$OCH3^b$	H	SH	sugar
1944	$OCH3^b$	H	SH	C-glycosyl compound
1945	$OCH3^b$	H	OCH3	OH
1946	$OCH3^b$	H	OCH3	D-glucitol
1947	$OCH3^b$	H	OCH3	SO_3H
1948	$OCH3^b$	H	OCH3	PO_3H_2
1949	$OCH3^b$	H	OCH3	CHO
1950	$OCH3^b$	H	OCH3	COOH
1951	$OCH3^b$	H	OCH3	CH_2OH
1952	$OCH3^b$	H	OCH3	sugar
1953	$OCH3^b$	H	OCH3	C-glycosyl compound
1954	$OCH3^b$	F	H	OH
1955	$OCH3^b$	F	H	D-glucitol
1956	$OCH3^b$	F	H	SO_3H
1957	$OCH3^b$	F	H	PO_3H_2
1958	$OCH3^b$	F	H	CHO
1959	$OCH3^b$	F	H	COOH
1960	$OCH3^b$	F	H	CH_2OH
1961	$OCH3^b$	F	H	sugar
1962	$OCH3^b$	F	H	C-glycosyl compound
1963	$OCH3^b$	F	OH	OH
1964	$OCH3^b$	F	OH	D-glucitol
1965	$OCH3^b$	F	OH	SO_3H
1966	$OCH3^b$	F	OH	PO_3H_2
1967	$OCH3^b$	F	OH	CHO
1968	$OCH3^b$	F	OH	COOH
1969	$OCH3^b$	F	OH	CH_2OH
1970	$OCH3^b$	F	OH	sugar
1971	$OCH3^b$	F	OH	C-glycosyl compound
1972	$OCH3^b$	F	CH3	OH
1973	$OCH3^b$	F	CH3	D-glucitol

1974	OCH3[b]	F	CH3	SO_3H
1975	OCH3[b]	F	CH3	PO_3H_2
1976	OCH3[b]	F	CH3	CHO
1977	OCH3[b]	F	CH3	COOH
1978	OCH3[b]	F	CH3	CH_2OH
1979	OCH3[b]	F	CH3	sugar
1980	OCH3[b]	F	CH3	C-glycosyl compound
1981	OCH3[b]	F	Cl	OH
1982	OCH3[b]	F	Cl	D-glucitol
1983	OCH3[b]	F	Cl	SO_3H
1984	OCH3[b]	F	Cl	PO_3H_2
1985	OCH3[b]	F	Cl	CHO
1986	OCH3[b]	F	Cl	COOH
1987	OCH3[b]	F	Cl	CH_2OH
1988	OCH3[b]	F	Cl	sugar
1989	OCH3[b]	F	Cl	C-glycosyl compound
1990	OCH3[b]	F	$B(OH)_2$	OH
1991	OCH3[b]	F	$B(OH)_2$	D-glucitol
1992	OCH3[b]	F	$B(OH)_2$	SO_3H
1993	OCH3[b]	F	$B(OH)_2$	PO_3H_2
1994	OCH3[b]	F	$B(OH)_2$	CHO
1995	OCH3[b]	F	$B(OH)_2$	COOH
1996	OCH3[b]	F	$B(OH)_2$	CH_2OH
1997	OCH3[b]	F	$B(OH)_2$	sugar
1998	OCH3[b]	F	$B(OH)_2$	C-glycosyl compound
1999	OCH3[b]	F	SH	OH
2000	OCH3[b]	F	SH	D-glucitol
2001	OCH3[b]	F	SH	SO_3H
2002	OCH3[b]	F	SH	PO_3H_2
2003	OCH3[b]	F	SH	CHO
2004	OCH3[b]	F	SH	COOH
2005	OCH3[b]	F	SH	CH_2OH
2006	OCH3[b]	F	SH	sugar
2007	OCH3[b]	F	SH	C-glycosyl compound

2008	OCH3[b]	F	OCH3	OH
2009	OCH3[b]	F	OCH3	D-glucitol
2010	OCH3[b]	F	OCH3	SO_3H
2011	OCH3[b]	F	OCH3	PO_3H_2
2012	OCH3[b]	F	OCH3	CHO
2013	OCH3[b]	F	OCH3	COOH
2014	OCH3[b]	F	OCH3	CH_2OH
2015	OCH3[b]	F	OCH3	sugar
2016	OCH3[b]	F	OCH3	C-glycosyl compound
2017	OCH3[b]	Cl	H	OH
2018	OCH3[b]	Cl	H	D-glucitol
2019	OCH3[b]	Cl	H	SO_3H
2020	OCH3[b]	Cl	H	PO_3H_2
2021	OCH3[b]	Cl	H	CHO
2022	OCH3[b]	Cl	H	COOH
2023	OCH3[b]	Cl	H	CH_2OH
2024	OCH3[b]	Cl	H	sugar
2025	OCH3[b]	Cl	H	C-glycosyl compound
2026	OCH3[b]	Cl	OH	OH
2027	OCH3[b]	Cl	OH	D-glucitol
2028	OCH3[b]	Cl	OH	SO_3H
2029	OCH3[b]	Cl	OH	PO_3H_2
2030	OCH3[b]	Cl	OH	CHO
2031	OCH3[b]	Cl	OH	COOH
2032	OCH3[b]	Cl	OH	CH_2OH
2033	OCH3[b]	Cl	OH	sugar
2034	OCH3[b]	Cl	OH	C-glycosyl compound
2035	OCH3[b]	Cl	CH3	OH
2036	OCH3[b]	Cl	CH3	D-glucitol
2037	OCH3[b]	Cl	CH3	SO_3H
2038	OCH3[b]	Cl	CH3	PO_3H_2
2039	OCH3[b]	Cl	CH3	CHO
2040	OCH3[b]	Cl	CH3	COOH
2041	OCH3[b]	Cl	CH3	CH_2OH

2042	$OCH3^b$	Cl	CH3	sugar
2043	$OCH3^b$	Cl	CH3	C-glycosyl compound
2044	$OCH3^b$	Cl	Cl	OH
2045	$OCH3^b$	Cl	Cl	D-glucitol
2046	$OCH3^b$	Cl	Cl	SO_3H
2047	$OCH3^b$	Cl	Cl	PO_3H_2
2048	$OCH3^b$	Cl	Cl	CHO
2049	$OCH3^b$	Cl	Cl	COOH
2050	$OCH3^b$	Cl	Cl	CH_2OH
2051	$OCH3^b$	Cl	Cl	sugar
2052	$OCH3^b$	Cl	Cl	C-glycosyl compound
2053	$OCH3^b$	Cl	$B(OH)_2$	OH
2054	$OCH3^b$	Cl	$B(OH)_2$	D-glucitol
2055	$OCH3^b$	Cl	$B(OH)_2$	SO_3H
2056	$OCH3^b$	Cl	$B(OH)_2$	PO_3H_2
2057	$OCH3^b$	Cl	$B(OH)_2$	CHO
2058	$OCH3^b$	Cl	$B(OH)_2$	COOH
2059	$OCH3^b$	Cl	$B(OH)_2$	CH_2OH
2060	$OCH3^b$	Cl	$B(OH)_2$	sugar
2061	$OCH3^b$	Cl	$B(OH)_2$	C-glycosyl compound
2062	$OCH3^b$	Cl	SH	OH
2063	$OCH3^b$	Cl	SH	D-glucitol
2064	$OCH3^b$	Cl	SH	SO_3H
2065	$OCH3^b$	Cl	SH	PO_3H_2
2066	$OCH3^b$	Cl	SH	CHO
2067	$OCH3^b$	Cl	SH	COOH
2068	$OCH3^b$	Cl	SH	CH_2OH
2069	$OCH3^b$	Cl	SH	sugar
2070	$OCH3^b$	Cl	SH	C-glycosyl compound
2071	$OCH3^b$	Cl	OCH3	OH
2072	$OCH3^b$	Cl	OCH3	D-glucitol
2073	$OCH3^b$	Cl	OCH3	SO_3H
2074	$OCH3^b$	Cl	OCH3	PO_3H_2
2075	$OCH3^b$	Cl	OCH3	CHO

2076	OCH3[b]	Cl	OCH3	COOH
2077	OCH3[b]	Cl	OCH3	CH_2OH
2078	OCH3[b]	Cl	OCH3	sugar
2079	OCH3[b]	Cl	OCH3	C-glycosyl compound
2080	OCH3[b]	CN	H	OH
2081	OCH3[b]	CN	H	D-glucitol
2082	OCH3[b]	CN	H	SO_3H
2083	OCH3[b]	CN	H	PO_3H_2
2084	OCH3[b]	CN	H	CHO
2085	OCH3[b]	CN	H	COOH
2086	OCH3[b]	CN	H	CH_2OH
2087	OCH3[b]	CN	H	sugar
2088	OCH3[b]	CN	H	C-glycosyl compound
2089	OCH3[b]	CN	OH	OH
2090	OCH3[b]	CN	OH	D-glucitol
2091	OCH3[b]	CN	OH	SO_3H
2092	OCH3[b]	CN	OH	PO_3H_2
2093	OCH3[b]	CN	OH	CHO
2094	OCH3[b]	CN	OH	COOH
2095	OCH3[b]	CN	OH	CH_2OH
2096	OCH3[b]	CN	OH	sugar
2097	OCH3[b]	CN	OH	C-glycosyl compound
2098	OCH3[b]	CN	CH3	OH
2099	OCH3[b]	CN	CH3	D-glucitol
2100	OCH3[b]	CN	CH3	SO_3H
2101	OCH3[b]	CN	CH3	PO_3H_2
2102	OCH3[b]	CN	CH3	CHO
2103	OCH3[b]	CN	CH3	COOH
2104	OCH3[b]	CN	CH3	CH_2OH
2105	OCH3[b]	CN	CH3	sugar
2106	OCH3[b]	CN	CH3	C-glycosyl compound
2107	OCH3[b]	CN	Cl	OH
2108	OCH3[b]	CN	Cl	D-glucitol
2109	OCH3[b]	CN	Cl	SO_3H

2110	OCH3[b]	CN	Cl	PO_3H_2
2111	OCH3[b]	CN	Cl	CHO
2112	OCH3[b]	CN	Cl	COOH
2113	OCH3[b]	CN	Cl	CH_2OH
2114	OCH3[b]	CN	Cl	sugar
2115	OCH3[b]	CN	Cl	C-glycosyl compound
2116	OCH3[b]	CN	$B(OH)_2$	OH
2117	OCH3[b]	CN	$B(OH)_2$	D-glucitol
2118	OCH3[b]	CN	$B(OH)_2$	SO_3H
2119	OCH3[b]	CN	$B(OH)_2$	PO_3H_2
2120	OCH3[b]	CN	$B(OH)_2$	CHO
2121	OCH3[b]	CN	$B(OH)_2$	COOH
2122	OCH3[b]	CN	$B(OH)_2$	CH_2OH
2123	OCH3[b]	CN	$B(OH)_2$	sugar
2124	OCH3[b]	CN	$B(OH)_2$	C-glycosyl compound
2125	OCH3[b]	CN	SH	OH
2126	OCH3[b]	CN	SH	D-glucitol
2127	OCH3[b]	CN	SH	SO_3H
2128	OCH3[b]	CN	SH	PO_3H_2
2129	OCH3[b]	CN	SH	CHO
2130	OCH3[b]	CN	SH	COOH
2131	OCH3[b]	CN	SH	CH_2OH
2132	OCH3[b]	CN	SH	sugar
2133	OCH3[b]	CN	SH	C-glycosyl compound
2134	OCH3[b]	CN	OCH3	OH
2135	OCH3[b]	CN	OCH3	D-glucitol
2136	OCH3[b]	CN	OCH3	SO_3H
2137	OCH3[b]	CN	OCH3	PO_3H_2
2138	OCH3[b]	CN	OCH3	CHO
2139	OCH3[b]	CN	OCH3	COOH
2140	OCH3[b]	CN	OCH3	CH_2OH
2141	OCH3[b]	CN	OCH3	sugar
2142	OCH3[b]	CN	OCH3	C-glycosyl compound
2143	OCH3[b]	CH_3[a]	H	OH

2144	OCH3[b]	CH_3[a]	H	D-glucitol
2145	OCH3[b]	CH_3[a]	H	SO_3H
2146	OCH3[b]	CH_3[a]	H	PO_3H_2
2147	OCH3[b]	CH_3[a]	H	CHO
2148	OCH3[b]	CH_3[a]	H	COOH
2149	OCH3[b]	CH_3[a]	H	CH_2OH
2150	OCH3[b]	CH_3[a]	H	sugar
2151	OCH3[b]	CH_3[a]	H	C-glycosyl compound
2152	OCH3[b]	CH_3[a]	OH	OH
2153	OCH3[b]	CH_3[a]	OH	D-glucitol
2154	OCH3[b]	CH_3[a]	OH	SO_3H
2155	OCH3[b]	CH_3[a]	OH	PO_3H_2
2156	OCH3[b]	CH_3[a]	OH	CHO
2157	OCH3[b]	CH_3[a]	OH	COOH
2158	OCH3[b]	CH_3[a]	OH	CH_2OH
2159	OCH3[b]	CH_3[a]	OH	sugar
2160	OCH3[b]	CH_3[a]	OH	C-glycosyl compound
2161	OCH3[b]	CH_3[a]	CH3	OH
2162	OCH3[b]	CH_3[a]	CH3	D-glucitol
2163	OCH3[b]	CH_3[a]	CH3	SO_3H
2164	OCH3[b]	CH_3[a]	CH3	PO_3H_2
2165	OCH3[b]	CH_3[a]	CH3	CHO
2166	OCH3[b]	CH_3[a]	CH3	COOH
2167	OCH3[b]	CH_3[a]	CH3	CH_2OH
2168	OCH3[b]	CH_3[a]	CH3	sugar
2169	OCH3[b]	CH_3[a]	CH3	C-glycosyl compound
2170	OCH3[b]	CH_3[a]	Cl	OH
2171	OCH3[b]	CH_3[a]	Cl	D-glucitol
2172	OCH3[b]	CH_3[a]	Cl	SO_3H
2173	OCH3[b]	CH_3[a]	Cl	PO_3H_2
2174	OCH3[b]	CH_3[a]	Cl	CHO
2175	OCH3[b]	CH_3[a]	Cl	COOH

2176	OCH3[b]	CH_3[a]	Cl	CH_2OH
2177	OCH3[b]	CH_3[a]	Cl	sugar
2178	OCH3[b]	CH_3[a]	Cl	C-glycosyl compound
2179	OCH3[b]	CH_3[a]	$B(OH)_2$	OH
2180	OCH3[b]	CH_3[a]	$B(OH)_2$	D-glucitol
2181	OCH3[b]	CH_3[a]	$B(OH)_2$	SO_3H
2182	OCH3[b]	CH_3[a]	$B(OH)_2$	PO_3H_2
2183	OCH3[b]	CH_3[a]	$B(OH)_2$	CHO
2184	OCH3[b]	CH_3[a]	$B(OH)_2$	COOH
2185	OCH3[b]	CH_3[a]	$B(OH)_2$	CH_2OH
2186	OCH3[b]	CH_3[a]	$B(OH)_2$	sugar
2187	OCH3[b]	CH_3[a]	$B(OH)_2$	C-glycosyl compound
2188	OCH3[b]	CH_3[a]	SH	OH
2189	OCH3[b]	CH_3[a]	SH	D-glucitol
2190	OCH3[b]	CH_3[a]	SH	SO_3H
2191	OCH3[b]	CH_3[a]	SH	PO_3H_2
2192	OCH3[b]	CH_3[a]	SH	CHO
2193	OCH3[b]	CH_3[a]	SH	COOH
2194	OCH3[b]	CH_3[a]	SH	CH_2OH
2195	OCH3[b]	CH_3[a]	SH	sugar
2196	OCH3[b]	CH_3[a]	SH	C-glycosyl compound
2197	OCH3[b]	CH_3[a]	OCH3	OH
2198	OCH3[b]	CH_3[a]	OCH3	D-glucitol
2199	OCH3[b]	CH_3[a]	OCH3	SO_3H
2200	OCH3[b]	CH_3[a]	OCH3	PO_3H_2
2201	OCH3[b]	CH_3[a]	OCH3	CHO
2202	OCH3[b]	CH_3[a]	OCH3	COOH
2203	OCH3[b]	CH_3[a]	OCH3	CH_2OH
2204	OCH3[b]	CH_3[a]	OCH3	sugar
2205	OCH3[b]	CH_3[a]	OCH3	C-glycosyl compound
2206	OCH3[b]	OCH3[b]	H	OH
2207	OCH3[b]	OCH3[b]	H	D-glucitol
2208	OCH3[b]	OCH3[b]	H	SO_3H

2209	OCH3[b]	OCH3[b]	H	PO_3H_2
2210	OCH3[b]	OCH3[b]	H	CHO
2211	OCH3[b]	OCH3[b]	H	COOH
2212	OCH3[b]	OCH3[b]	H	CH_2OH
2213	OCH3[b]	OCH3[b]	H	sugar
2214	OCH3[b]	OCH3[b]	H	C-glycosyl compound
2215	OCH3[b]	OCH3[b]	OH	OH
2216	OCH3[b]	OCH3[b]	OH	D-glucitol
2217	OCH3[b]	OCH3[b]	OH	SO_3H
2218	OCH3[b]	OCH3[b]	OH	PO_3H_2
2219	OCH3[b]	OCH3[b]	OH	CHO
2220	OCH3[b]	OCH3[b]	OH	COOH
2221	OCH3[b]	OCH3[b]	OH	CH_2OH
2222	OCH3[b]	OCH3[b]	OH	sugar
2223	OCH3[b]	OCH3[b]	OH	C-glycosyl compound
2224	OCH3[b]	OCH3[b]	CH3	OH
2225	OCH3[b]	OCH3[b]	CH3	D-glucitol
2226	OCH3[b]	OCH3[b]	CH3	SO_3H
2227	OCH3[b]	OCH3[b]	CH3	PO_3H_2
2228	OCH3[b]	OCH3[b]	CH3	CHO
2229	OCH3[b]	OCH3[b]	CH3	COOH
2230	OCH3[b]	OCH3[b]	CH3	CH_2OH
2231	OCH3[b]	OCH3[b]	CH3	sugar
2232	OCH3[b]	OCH3[b]	CH3	C-glycosyl compound
2233	OCH3[b]	OCH3[b]	Cl	OH
2234	OCH3[b]	OCH3[b]	Cl	D-glucitol
2235	OCH3[b]	OCH3[b]	Cl	SO_3H
2236	OCH3[b]	OCH3[b]	Cl	PO_3H_2
2237	OCH3[b]	OCH3[b]	Cl	CHO
2238	OCH3[b]	OCH3[b]	Cl	COOH
2239	OCH3[b]	OCH3[b]	Cl	CH_2OH
2240	OCH3[b]	OCH3[b]	Cl	sugar
2241	OCH3[b]	OCH3[b]	Cl	C-glycosyl compound
2242	OCH3[b]	OCH3[b]	$B(OH)_2$	OH

2243	$OCH3^b$	$OCH3^b$	$B(OH)_2$	D-glucitol
2244	$OCH3^b$	$OCH3^b$	$B(OH)_2$	SO_3H
2245	$OCH3^b$	$OCH3^b$	$B(OH)_2$	PO_3H_2
2246	$OCH3^b$	$OCH3^b$	$B(OH)_2$	CHO
2247	$OCH3^b$	$OCH3^b$	$B(OH)_2$	COOH
2248	$OCH3^b$	$OCH3^b$	$B(OH)_2$	CH_2OH
2249	$OCH3^b$	$OCH3^b$	$B(OH)_2$	sugar
2250	$OCH3^b$	$OCH3^b$	$B(OH)_2$	C-glycosyl compound
2251	$OCH3^b$	$OCH3^b$	SH	OH
2252	$OCH3^b$	$OCH3^b$	SH	D-glucitol
2253	$OCH3^b$	$OCH3^b$	SH	SO_3H
2254	$OCH3^b$	$OCH3^b$	SH	PO_3H_2
2255	$OCH3^b$	$OCH3^b$	SH	CHO
2256	$OCH3^b$	$OCH3^b$	SH	COOH
2257	$OCH3^b$	$OCH3^b$	SH	CH_2OH
2258	$OCH3^b$	$OCH3^b$	SH	sugar
2259	$OCH3^b$	$OCH3^b$	SH	C-glycosyl compound
2260	$OCH3^b$	$OCH3^b$	OCH3	OH
2261	$OCH3^b$	$OCH3^b$	OCH3	D-glucitol
2262	$OCH3^b$	$OCH3^b$	OCH3	SO_3H
2263	$OCH3^b$	$OCH3^b$	OCH3	PO_3H_2
2264	$OCH3^b$	$OCH3^b$	OCH3	CHO
2265	$OCH3^b$	$OCH3^b$	OCH3	COOH
2266	$OCH3^b$	$OCH3^b$	OCH3	CH_2OH
2267	$OCH3^b$	$OCH3^b$	OCH3	sugar
2268	$OCH3^b$	$OCH3^b$	OCH3	C-glycosyl compound

[a] optionally substituted with one, two or three F
[b] optionally substituted with two or three F

TABLE 4

row number	R1	R2	R4	R5
1	ortho	ortho	3-	ortho
2	ortho	ortho	3-	meta
3	ortho	ortho	3-	para
4	ortho	ortho	2-	ortho
5	ortho	ortho	2-	meta
6	ortho	ortho	2-	para
7	ortho	meta	3-	ortho
8	ortho	meta	3-	meta
9	ortho	meta	3-	para
10	ortho	meta	2-	ortho
11	ortho	meta	2-	meta
12	ortho	meta	2-	para
13	ortho	para	3-	ortho
14	ortho	para	3-	meta
15	ortho	para	3-	para
16	ortho	para	2-	ortho
17	ortho	para	2-	meta
18	ortho	para	2-	para
19	meta	ortho	3-	ortho
20	meta	ortho	3-	meta
21	meta	ortho	3-	para
22	meta	ortho	2-	ortho
23	meta	ortho	2-	meta
24	meta	ortho	2-	para
25	meta	meta	3-	ortho
26	meta	meta	3-	meta
27	meta	meta	3-	para
28	meta	meta	2-	ortho
29	meta	meta	2-	meta
30	meta	meta	2-	para
31	meta	para	3-	ortho
32	meta	para	3-	meta
33	meta	para	3-	para
34	meta	para	2-	ortho
35	meta	para	2-	meta

36	meta	para	2-	para
37	para	ortho	3-	ortho
38	para	ortho	3-	meta
39	para	ortho	3-	para
40	para	ortho	2-	ortho
41	para	ortho	2-	meta
42	para	ortho	2-	para
43	para	meta	3-	ortho
44	para	meta	3-	meta
45	para	meta	3-	para
46	para	meta	2-	ortho
47	para	meta	2-	meta
48	para	meta	2-	para
49	para	para	3-	ortho
50	para	para	3-	meta
51	para	para	3-	para
52	para	para	2-	ortho
53	para	para	2-	meta
54	para	para	2-	para

[00260] **Table 5** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is F, R^4 is OH and R^5 is OH (i.e. Table 3, row 1) according to the positions defined by all rows of Table 4.

1	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
2	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
3	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
4	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
5	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
6	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
7	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
8	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
9	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
10	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-fluorophenyl)-3-

	hydroxypropyl]-1-phenylazetidin-2-one
11	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
12	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
13	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
14	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
15	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
16	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
17	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
18	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one

[00261] **Table 6** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is F, R^4 is OH and R^5 is D-glucitol (i.e. Table 3, row 2) according to the positions defined by all rows of Table 4.

1	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
2	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
3	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
4	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
5	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
6	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol
7	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
8	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
9	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
10	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
11	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
12	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol
13	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-

	oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
14	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
15	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
16	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
17	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
18	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol

[00262] **Table 7** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is F, R^4 is OH and R^5 is SO_3H (i.e. Table 3, row 3) according to the positions defined by all rows of Table 4.

1	4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
2	4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
3	4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
4	4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
5	4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
6	4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid
7	4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
8	4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
9	4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
10	4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
11	4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
12	4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid
13	4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
14	4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
15	4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
16	4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-

	2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
17	4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
18	4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid

[00263] **Table 8** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is F, R^4 is OH and R^5 is PO_3H_2 (i.e. Table 3, row 4) according to the positions defined by all rows of Table 4.

1	(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
2	(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
3	(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
4	(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
5	(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
6	(4'-{(2S,3R)-3-[(3S)-3-(2-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid
7	(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
8	(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
9	(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
10	(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
11	(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
12	(4'-{(2S,3R)-3-[(3S)-3-(3-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid
13	(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
14	(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
15	(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
16	(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
17	(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
18	(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid

[00264] **Table 9** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is H, R^4 is OH and R^5 is OH (i.e. Table 3, row 5) according to the positions defined by all rows of Table 4.

1	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-1-phenylazetidin-2-one
2	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-1-phenylazetidin-2-one
3	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-1-phenylazetidin-2-one
4	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-1-phenylazetidin-2-one
5	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-1-phenylazetidin-2-one
6	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-1-phenylazetidin-2-one

[00265] **Table 10** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is H, R^4 is OH and R^5 is D-glucitol (i.e. Table 3, row 6) according to the positions defined by all rows of Table 4.

1	(1S)-1,5-anhydro-1-(3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-2-yl)-D-glucitol
2	(1S)-1,5-anhydro-1-(3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol
3	(1S)-1,5-anhydro-1-(3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-yl)-D-glucitol
4	(1S)-1,5-anhydro-1-(2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-2-yl)-D-glucitol
5	(1S)-1,5-anhydro-1-(2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol
6	(1S)-1,5-anhydro-1-(2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-yl)-D-glucitol

[00266] **Table 11** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is H, R^4 is OH and R^5 is SO_3H (i.e. Table 3, row 7) according to the positions defined by all rows of Table 4.

1	3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-2-sulfonic acid
2	3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-sulfonic acid
3	3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-sulfonic acid
4	2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-2-sulfonic acid

5	2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-sulfonic acid
6	2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-sulfonic acid

[00267] **Table 12** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is H, R^4 is OH and R^5 is PO_3H_2 (i.e. Table 3, row 8) according to the positions defined by all rows of Table 4.

1	(3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-2-yl)phosphonic acid
2	(3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonic acid
3	(3'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-yl)phosphonic acid
4	(2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-2-yl)phosphonic acid
5	(2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonic acid
6	(2'-hydroxy-4'-{(2S,3R)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-4-yl)phosphonic acid

[00268] **Table 13** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is Cl, R^4 is OH and R^5 is OH (i.e. Table 3, row 9) according to the positions defined by all rows of Table 4.

1	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
2	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
3	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
4	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
5	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
6	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
7	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
8	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
9	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
10	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one

11	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-cjlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
12	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
13	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
14	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
15	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
16	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
17	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one
18	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4chlorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one

[00269] **Table 14** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is Cl, R^4 is OH and R^5 is D-glucitol (i.e. Table 3, row 10) according to the positions defined by all rows of Table 4.

1	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
2	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
3	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
4	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
5	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
6	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol
7	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
8	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
9	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-

	glucitol
10	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
11	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
12	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol
13	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
14	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
15	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
16	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
17	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
18	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol

[00270] **Table 15** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is Cl, R^4 is OH and R^5 is SO_3H (i.e. Table 3, row 11) according to the positions defined by all rows of Table 4.

1	4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
2	4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
3	4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
4	4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
5	4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
6	4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid
7	4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid

8	4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
9	4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
10	4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
11	4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
12	4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid
13	4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
14	4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
15	4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
16	4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
17	4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
18	4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid

[00271] **Table 16** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is H, R^2 is Cl, R^4 is OH and R^5 is PO_3H_2 (i.e. Table 3, row 12) according to the positions defined by all rows of Table 4.

1	(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
2	(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
3	(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
4	(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
5	(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
6	(4'-{(2S,3R)-3-[(3S)-3-(2-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid
7	(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
8	(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
9	(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
10	(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid

11	(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
12	(4'-{(2S,3R)-3-[(3S)-3-(3-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid
13	(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
14	(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
15	(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
16	(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
17	(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
18	(4'-{(2S,3R)-3-[(3S)-3-(4-chlorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid

[00272] **Table 17** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is F, R^2 is H, R^4 is OH and R^5 is OH (i.e. Table 3, row 13) according to the positions defined by all rows of Table 4.

1	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
2	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
3	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
4	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
5	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
6	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
7	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
8	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
9	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
10	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
11	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
12	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
13	(3R,4S)-4-(2',3-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one

14	(3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
15	(3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
16	(3R,4S)-4-(2,2'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
17	(3R,4S)-4-(2,3'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one
18	(3R,4S)-4-(2,4'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]azetidin-2-one

[00273] **Table 18** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is F, R^2 is H, R^4 is OH and R^5 is D-glucitol (i.e. Table 3, row 14) according to the positions defined by all rows of Table 4.

1	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
2	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
3	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
4	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
5	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
6	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol
7	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
8	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
9	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
10	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol
11	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
12	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol
13	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)-D-glucitol
14	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol
15	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol
16	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)-D-glucitol

17	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)-D-glucitol
18	(1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)-D-glucitol

[00274] **Table 19** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is F, R^2 is H, R^4 is OH and R^5 is SO_3H (i.e. Table 3, row 15) according to the positions defined by all rows of Table 4.

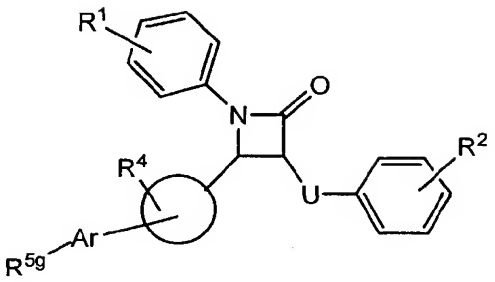
1	4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
2	4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
3	4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
4	4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
5	4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
6	4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid
7	4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
8	4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
9	4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
10	4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
11	4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
12	4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid
13	4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-sulfonic acid
14	4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid
15	4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid
16	4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-sulfonic acid
17	4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-sulfonic acid
18	4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-sulfonic acid

[00275] **Table 20** lists the compounds disclosed by substitution of Formula VIII wherein R^1 is F, R^2 is H, R^4 is OH and R^5 is PO_3H_2 (i.e. Table 3, row 16) according to the positions defined by all rows of Table 4.

1	(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
2	(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
3	(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
4	(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
5	(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
6	(4'-{(2S,3R)-1-(2-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid
7	(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
8	(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
9	(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
10	(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
11	(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
12	(4'-{(2S,3R)-1-(3-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid
13	(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-2-yl)phosphonic acid
14	(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid
15	(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid
16	(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-2-yl)phosphonic acid
17	(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-3-yl)phosphonic acid
18	(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-hydroxy-3-phenylpropyl]-4-oxoazetidin-2-yl}-2'-hydroxybiphenyl-4-yl)phosphonic acid

CLAIMS

1. A compound of formula:



wherein

 represents an aryl or heteroaryl residue;

Ar represents an aryl residue;

R^1 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^2 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^4 represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^{5g} represents one, two, three, four or five residues on Ar chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

U is (C_2-C_6)-alkylene in which one or more $-CH_2-$ may be replaced by a radical chosen from -S-, -S(O)-, $-SO_2-$, -O-, -C(=O)-, -CHOH-, -NH-, CHF, CF_2, -CH(O-loweralkyl)-, -CH(O-loweracyl)-, $-CH(OSO_3H)-$, $-CH(OPO_3H_2)-$, $-CH(OB(OH)_2)-$, or -NOH-;

with the provisos that

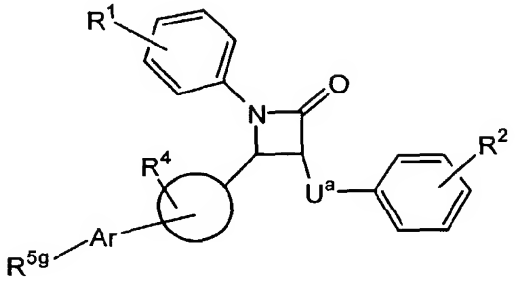
(1) R^{5g} cannot be -CN; 2,5-dimethoxy; 2,6-dimethoxy or halogen when neither of R^4 and R^{5g} includes an -OH, amino, loweralkyl, O-loweralkyl, alkoxycarbonyl, $-B(OH)_2$, $-PO_3H_2$ or $-SO_3H$ group;

(2) R^{5g} cannot be 2-hydroxy when  represents a 2,5-thienyl residue;

(3) adjacent $-CH_2-$ residues in U cannot be replaced by -S-, -S(O)-, $-SO_2-$ or -O- ; and

(4) -S-, -S(O)-, $-SO_2-$, -O- and -NH- residues in U cannot be separated only by a single carbon.

2. A compound of formula:



wherein

 represents an aryl or heteroaryl residue;

Ar represents an aryl residue;

R^1 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^2 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^4 represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^{5g} represents from one to five residues on Ar chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

U^a is $(C_2\text{-}C_6)$-alkylene in which one or more $-CH_2-$ may be replaced by a radical chosen from -S-, -S(O)-, $-SO_2-$, -O-, -C(=O)-, -CHOH-, -NH-, CHF, CF_2, -CH(O-loweralkyl)-, -CH(O-loweracyl)-, $-CH(OSO_3H)-$, $-CH(OPO_3H_2)-$, $-CH(OB(OH)_2)-$, or -NOH-;

with the provisos that

(1) R^{5g} cannot be -CN; 2,5-dimethoxy; 2,6-dimethoxy or halogen when neither of R^4 and R^{5g} includes an -OH, amino, loweralkyl, O-loweralkyl, alkoxycarbonyl, $-B(OH)_2$, $-PO_3H_2$ or $-SO_3H$ group;

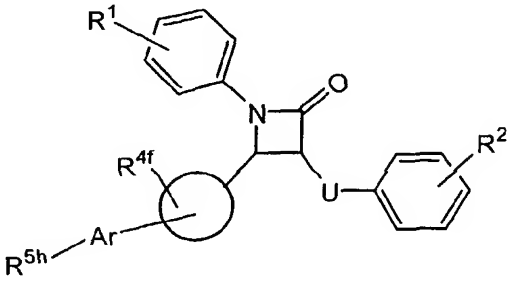
(2) R^{5g} cannot be 2-hydroxy when  represents a 2,5-thienyl residue;

(3) adjacent $-CH_2-$ residues in U^a cannot be replaced by -S-, -S(O)-, $-SO_2-$ or -O- ;

(4) -S-, -S(O)-, $-SO_2-$, -O- and -NH- residues in U^a cannot be separated only by a single carbon; and

(5) U^a cannot be $-CH_2CH_2CH(OH)-$, wherein the left end of the string is the point of attachment to the azetidinone ring and the right end of the string is the point of attachment to the phenyl ring.

3. A compound of formula:



wherein

 represents an aryl or heteroaryl residue;

Ar represents an aryl residue;

R^1 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^2 represents one, two, three, four or five residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy,

ethylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

R^{4f} is -OH, -SH or $-B(OH)_2$;

R^{5h} represents one, two, three, four or five residues on Ar chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, ethylenedioxy, hydroxyloweralkyl, -CN, $-CF_3$, nitro, -SH, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, alkoxycarbonyl, carboxyalkyl, carboxamido, alkylsulfoxide, acylamino, amidino, $-PO_3H_2$, $-SO_3H$, $-B(OH)_2$, a sugar, a polyol, a glucuronide and a sugar carbamate;

U is (C_2-C_6)-alkylene in which one or more $-CH_2-$ may be replaced by a radical chosen from -S-, -S(O)-, $-SO_2-$, -O-, -C(=O)-, -CHOH-, -NH-, CHF, CF_2, -CH(O-loweralkyl)-, -CH(O-loweracyl)-, $-CH(OSO_3H)-$, $-CH(OPO_3H_2)-$, $-CH(OB(OH)_2)-$, or -NOH-,

with the provisos that:

(1) adjacent $-CH_2-$ residues in U cannot be replaced by -S-, -S(O)-, $-SO_2-$ or -O- ; and

(2) -S-, -S(O)-, $-SO_2-$, -O- and -NH- residues in U cannot be separated only by a single carbon.

4. A compound according to claim 2 wherein U^a is chosen from $-SCH_2CH_2-$, $-S(O)CH_2CH_2-$, $-S(O)CH_2CH(OH)-$, $-SCH_2C(=O)-$, $-SCH_2CH(OH)-$, $-CH(OH)CH_2CH_2-$, $-CH(OH)CH_2CH(OH)-$, $-(CH_2)_3CH(OH)-$ and $-(CH_2)_4-$, wherein the left end of the string is the point of attachment to the azetidinone ring and the right end of the string is the point of attachment to the phenyl ring.

5. A compound according to claim 1 or 3 wherein U is chosen from $-CH_2CH_2CH(OH)-$, $-SCH_2CH_2-$, $-S(O)CH_2CH_2-$, $-S(O)CH_2CH(OH)-$, $-SCH_2C(=O)-$, $-SCH_2CH(OH)-$, $-CH(OH)CH_2CH_2-$, $-CH(OH)CH_2CH(OH)-$, $-(CH_2)_3CH(OH)-$ and $-(CH_2)_4-$, wherein the left end of the string is the point of attachment to the azetidinone ring and the right end of the string is the point of attachment to the phenyl ring.

6. A compound according to claim 5 wherein U is $-CH_2CH_2CH(OH)-$.

7. A compound according to any of claims 1-4 wherein

R^1 represents one or two residues;

R^2 represents one or two residues;

R^4 represents one or two residues; and

R^5 represents one or two residues.

8. A compound according to claim 7 wherein

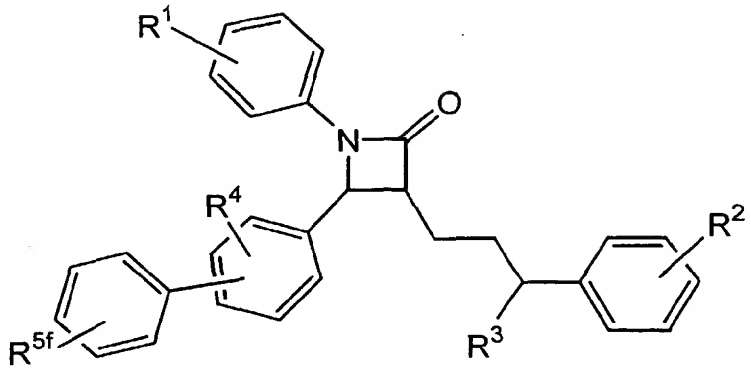
R^1 represents one residue;

R^2 represents one residue;

R^4 represents one residue; and

R^5 represents one residue.

9. A compound of formula:



wherein

R^1 and R^2 represent one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, hydroxyamidino, guanidino, dialkylguanidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide, and a sugar carbamate;

R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;

R^4 represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide and a sugar carbamate;

R^{5f} represents from one to five residues chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide a sugar carbamate and - $N^+R^6R^7R^8$ X^-;

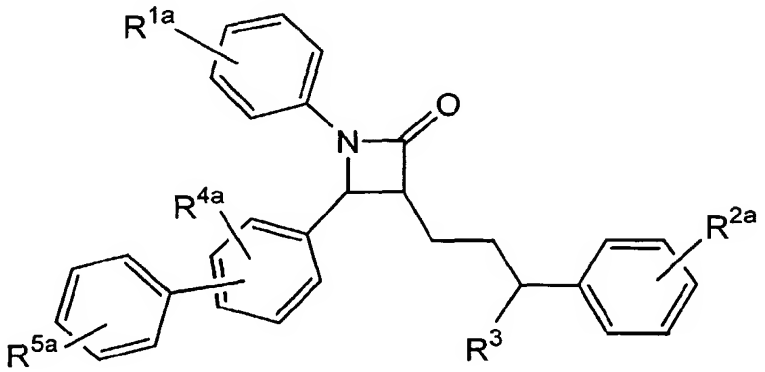
R^6 is C_1 to C_{20} hydrocarbon or forms a five- to seven-membered ring with R^7;

R^7 is alkyl or forms a five- to seven-membered ring with R^6;

R^8 is alkyl or together with R^6 or R^7 forms a second five- to seven-membered ring; and

X is an anion.

10. A compound of formula:



wherein

R^{2a} represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl,

acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy;

R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;

one of R^{1a}, R^{4a} and R^{5a} is -Q-A-$N^+R^9R^{10}R^{11}$ X^-

and the other two of R^{1a}, R^{4a} and R^{5a} are chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy;

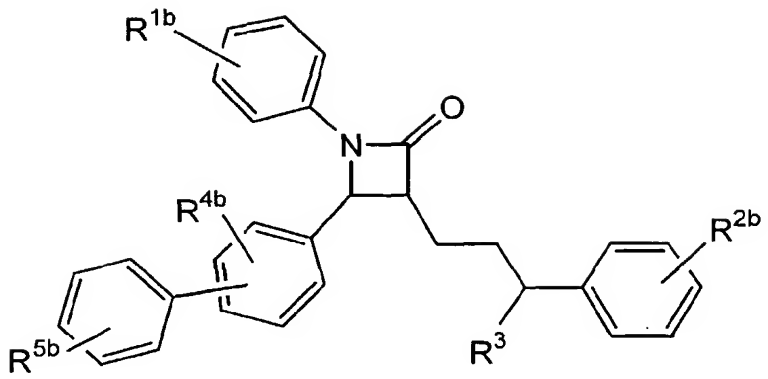
Q is chosen from a direct bond, -O-, -S-, -NH-, $-CH_2O-$, $-CH_2NH-$, -C(=O)-, -CONH-, -NHCO-, $-CH_2NH(C=O)-$, -O(C=O)-, -(C=O)O-, -NHCONH-, -OCONH- and -NHCOO- ;

A is chosen from C_2 to C_{20} hydrocarbon, substituted alkyl of 2 to 20 carbons, substituted aryl, substituted arylalkyl, and oxaalkyl of four to fifty carbons; and, when Q is a direct bond, -C(=O) or –O(C=O)-, A may additionally be methylene;

R^9 is C_1 to C_{20} hydrocarbon or forms a five- to seven-membered ring with A or R^{10};
R^{10} is alkyl, forms a double bond with A or forms a five- to seven-membered ring with R^9;
R^{11} is alkyl or together with R^{10} or R^9 forms a second five- to seven-membered ring; and

X is an anion.

11. A compound of formula:



wherein

R^{2b} represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy;

R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;

one of R^{1b}, R^{4b} and R^{5b} is R^{12} and the other two of R^{1b}, R^{4b} and R^{5b} are chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide, and a sugar carbamate;

R^{6a} is C_1 to C_{20} hydrocarbon;
R^{7a} is alkyl;
R^{8a} is alkyl;

R^{12} is (C_0 to C_{30})alkylene-G_n in which one or more -CH_2- residues in said alkylene may be replaced by -S-, -SO-, SO_2-, -O-, -NH-, -N(alkyl)-, -N(phenyl)-, -N(alkylphenyl)-,

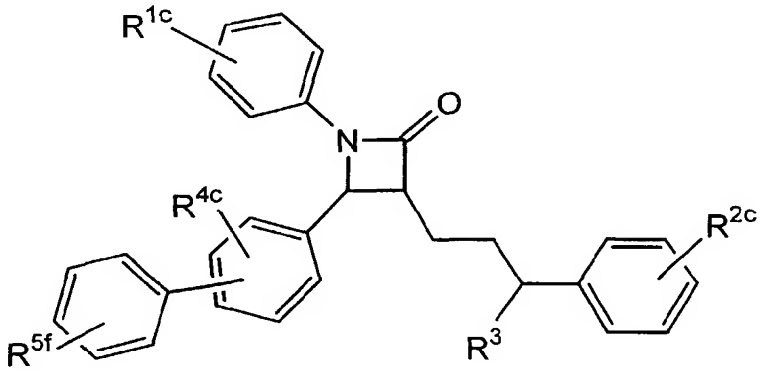
$-N^+(alkyl)_2-$, $-N^+(phenyl)_2-$, $-N^+(alkylphenyl)_2-$, -C(=O)-, -C(=S), CH=CH-, -C=C-, phenylene or -N[(C=O)alkyleneCOOH]-;

G is chosen from $-SO_3H$, $-PO_3H_2$, $-O-PO_3H_2$, -COOH, $-C(N=H)NH_2$, a polyol, a sugar, a glucuronide, a sugar carbamate, $-N^+R^{6a}R^{7a}R^{8a}\ X^-$, and a mono or bicyclic trialkylammoniumalkyl residue;

n is 1, 2, 3, 4 or 5 and

X is an anion.

12. A compound of formula:



wherein

R^{1c} and R^{2c} represent one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, hydroxyamidino, guanidino, dialkylguanidino, phenyl, benzyl, phenoxy, benzyloxy, a glucuronide, and a sugar carbamate;

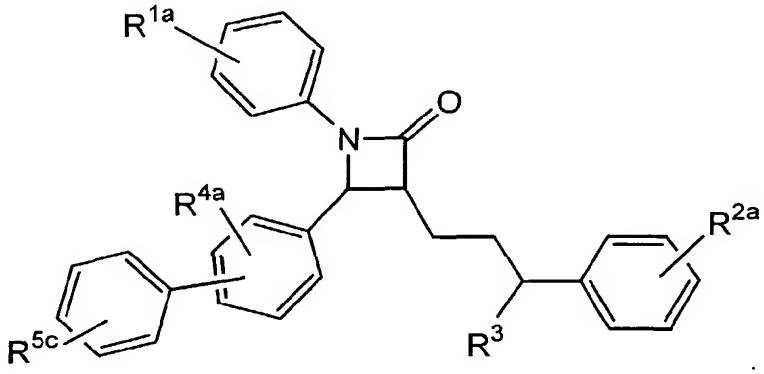
R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;

R^{4c} represents one, two, three or four residues chosen independently from H, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a glucuronide and a sugar carbamate;

R^{5f} represents one, two, three, four or five residues chosen independently from halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy, a sugar, a glucuronide a sugar carbamate and - $N^+R^6R^7R^8$ X^-;

R^6 is C_1 to C_{20} hydrocarbon or forms a five- to seven-membered ring with R^7;
R^7 is alkyl or forms a five- to seven-membered ring with R^6;
R^8 is alkyl or together with R^6 or R^7 forms a second five- to seven-membered ring; and
X is an anion.

13. A compound of formula:



wherein
R^{1a}, R^{2a} and R^{4a} each represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy;

R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;

R^{5c} is -Q-A-$N^+R^9R^{10}R^{11}$ X^- ;

Q is chosen from a direct bond, -O-, -S-, -NH-, $-CH_2O-$, $-CH_2NH-$, -C(=O)-, -CONH-, -NHCO-, $-CH_2NH(C=O)-$, -O(C=O)-, -(C=O)O-, -NHCONH-, -OCONH- and -NHCOO- ;

A is chosen from C_2 to C_{20} hydrocarbon, substituted alkyl of 2 to 20 carbons, substituted aryl, substituted arylalkyl, and oxaalkyl of four to fifty carbons; and, when Q is a direct bond, -C(=O) or –O(C=O)-, A may additionally be methylene;

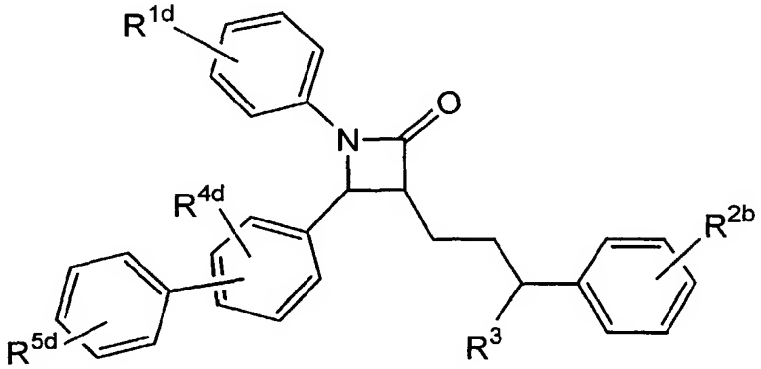
R^9 is C_1 to C_{20} hydrocarbon or forms a five- to seven-membered ring with A or R^{10};

R^{10} is alkyl, forms a double bond with A or forms a five- to seven-membered ring with R^9;

R^{11} is alkyl or together with R^{10} or R^9 forms a second five- to seven-membered ring; and

X is an anion.

14. A compound of formula:



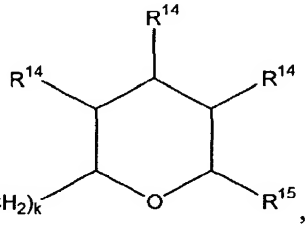
wherein

R^{2b} represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, and benzyloxy;

R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;

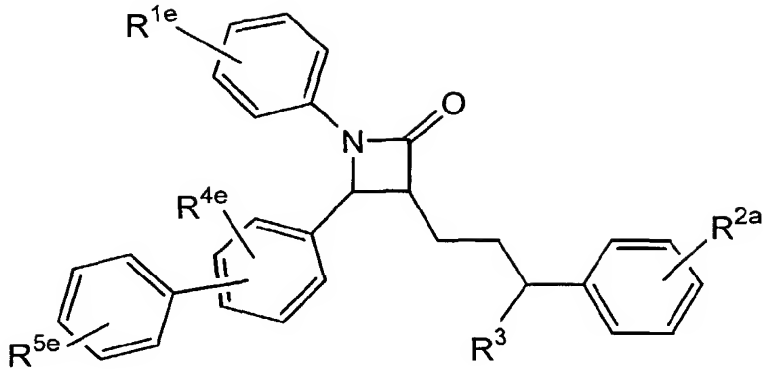
one of R^{1d}, R^{4d} and R^{5d} is R^{12a} and the other two of R^{1d}, R^{4d} and R^{5d} are chosen independently from hydrogen, halogen, -OH, loweralkyl, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy and R^{12a};

R^{6a} is C_1 to C_{20} hydrocarbon;
R^{7a} is alkyl;
R^{8a} is alkyl;

R^{12a} is 

, or, when R^{5d} is R^{12a}, R^{12a} may additionally be (C_0 to C_{30})alkylene-G_n in which one or more -CH_2- residues in said alkylene may be replaced by -S-, -SO-, SO_2-, -O-, -NH-, -N(alkyl)-, -N(phenyl)-, -N(alkylphenyl)-, -N^+(alkyl)$_2$-, -N^+(phenyl)$_2$-, -N^+(alkylphenyl)$_2$-, -C(=O)-, -C(=S), CH=CH-, -C=C-, phenylene or -N[(C=O)alkyleneCOOH]-;
G is chosen from -SO_3H, -PO_3H_2, -O-PO_3H_2, -COOH, -C(N=H)NH_2, a polyol, a sugar, a glucuronide, a sugar carbamate, -$N^+R^{6a}R^{7a}R^{8a}$ X^-, and a mono or bicyclic trialkylammoniumalkyl residue;
R^{13} is chosen from a direct bond, -C=C-, -OCH_2, -C(=O)- and -CHOH-;
R^{14} is chosen from -OH and -OC(=O)alkyl;
R^{15} is chosen from -CH_2OH, -CH_2OC(=O)alkyl and -COOalkyl;
j is 1, 2, 3, 4 or 5;
k is zero, 1, 2, 3, 4 or 5;
n is 1, 2, 3, 4 or 5; and
X is an anion.

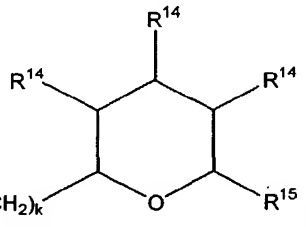
15. A compound of formula:



wherein

R^{1e}, R^{2a} and R^{4e} each represents one or two residues chosen independently from H, halogen, -OH, loweralkyl, OCF_2H, OCF_3, CF_2H, CH_2F, -O-loweralkyl, methylenedioxy, hydroxyloweralkyl, -CN, CF_3, nitro, -S-loweralkyl, amino, alkylamino, dialkylamino, aminosulfonyl, alkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, arylsulfonyl, acyl, carboxy, carboalkoxy, carboxamido, alkylsulfoxide, acylamino, amidino, phenyl, benzyl, phenoxy, benzyloxy;

R^3 is chosen from H, -OH, fluoro, -O-loweralkyl and -O-acyl;



R^{5c} is chosen from $-(CH_2)_jR^{13}(CH_2)_k-$ and (C_0 to C_{30})alkylene-G_n in which one or more -CH_2- residues in said alkylene may be replaced by -S-, -SO-, SO_2-, -O-, -NH-, -N(alkyl)-, -N(phenyl)-, -N(alkylphenyl)-, -N^+(alkyl)$_2$-, -N^+(phenyl)$_2$-, -N^+(alkylphenyl)$_2$-, -C(=O)-, -C(=S), CH=CH-, -C=C-, phenylene or -N[(C=O)alkyleneCOOH]-;

G is chosen from -SO_3H, -P(O)OH_2, -OP(O)OH_2, -COOH, -C(N=H)NH_2, a polyol, a sugar, a glucuronide, a sugar carbamate, -$N^+R^{6a}R^{7a}R^{8a}$ X^-, and a mono or bicyclic trialkylammoniumalkyl residue;

R^{6a} is C_1 to C_{20} hydrocarbon;

R^{7a} is alkyl;
R^{8a} is alkyl;
R^{13} is chosen from a direct bond, -C=C-, $-OCH_2$, -C(=O)- and -CHOH-;
R^{14} is chosen from -OH and -OC(=O)alkyl;
R^{15} is chosen from $-CH_2OH$, $-CH_2OC(=O)$alkyl and -COOalkyl;
j is 1, 2, 3, 4 or 5;
k is zero, 1, 2, 3, 4 or 5; and
X is an anion.

16. A compound according to any of claims 1, 2, 4 or 9-15 wherein R^1, R^2 and R^4 are chosen from H, halogen, -OH, and methoxy.

17. A compound according to any of claims 1-4, 9, 11 or 15 wherein at least one of R^1, R^2, R^4 and R^5 is chosen from a sugar, a glucuronide and a sugar carbamate.

18. A compound according to any of claims 1-4, 9, 11 or 15 wherein at least one of R^1, R^2, R^4 and R^5 is chosen from SO_3H and PO_3H_2.

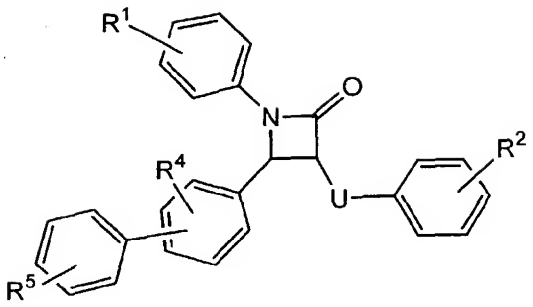
19. A compound according to any of claims 9-15 wherein R^3 is chosen from hydrogen and hydroxy.

20. A compound according to any of claims 1, 2, 4 or 9-15 wherein R^4 is hydrogen.

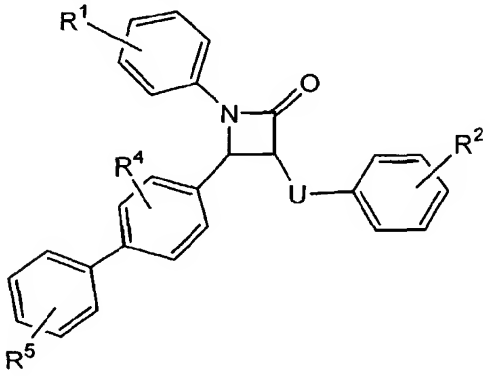
21. A compound according to any of claims 1, 2, 4 or 9-15 wherein R^4 is OH.

22. A compound according to any of claims 1-4 or 9-15 wherein R^5 is chosen from halogen, hydroxy, loweralkyl, -O-loweralkyl, CF_3, alkylsulfonyl, arylsulfonyl, hydroxymethyl, formyl, cyano, N,N-dimethylsulfonamido, carboxy, nitro, acetamido, dialkylamino, methylthio, vinyl, methylenedioxy, ethylenedioxy, carboxymethyl, $-PO_3H_2$, mercapto, $-SO_3H$, $-B(OH)_2$, a trialkylammonium cation, a sugar and a glucuronide.

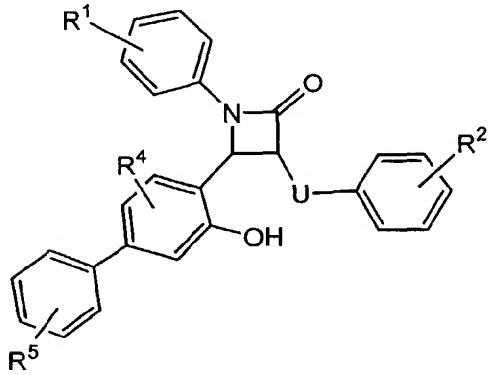
23. A compound according to any of claims 1, 2 or 3 of formula



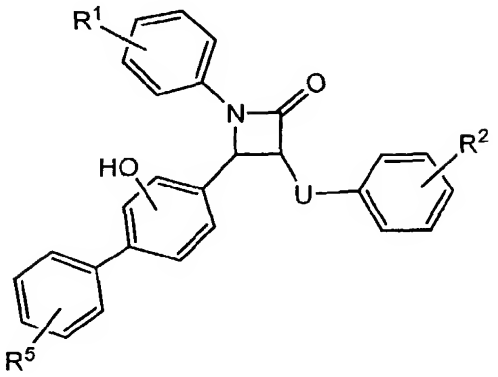
24. A compound according to claim 23 of formula



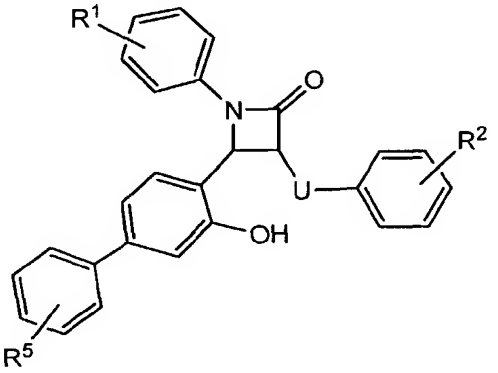
25. A compound according to claim 24 of formula



26. A compound according to claim 24 of formula

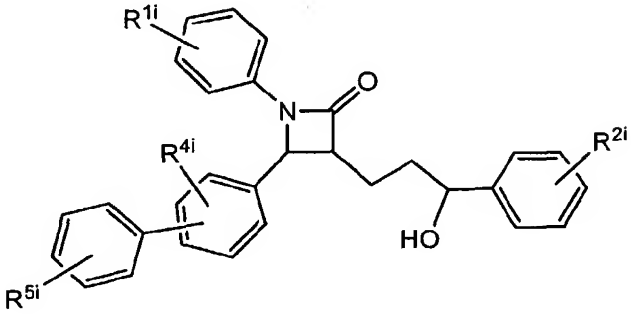


27. A compound according to claim 26 of formula



28. A compound according to claim 27 wherein R^1 is H.

29. A compound of formula

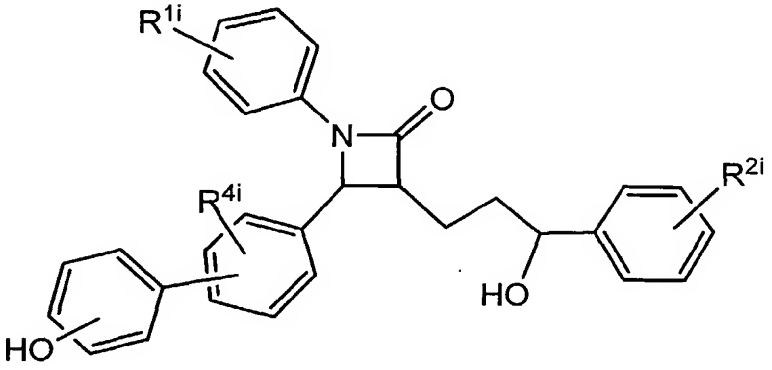


wherein

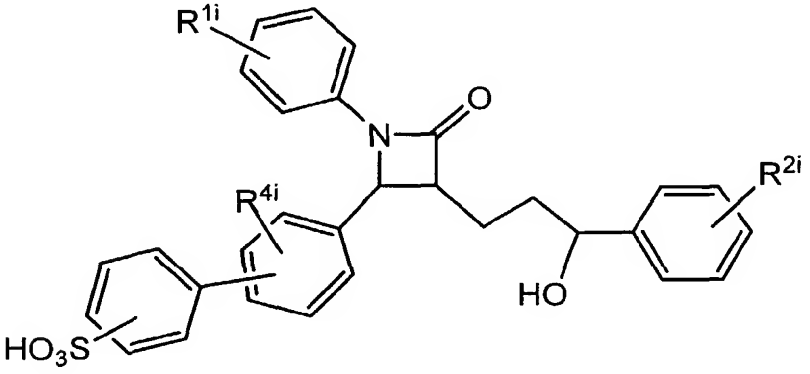
R^{1i} and R^{2i} are independently chosen from H, F, Cl, CH_3, CN, OCH_3, OCF_3, OCF_2H, CF_3, CF_2H, and CH_2F;

R^{4i} is chosen from H, F, Cl, CH_3, OCH_3, OH, $B(OH)_2$, and SH; and
R^{5i} is chosen from OH, SO_3H, PO_3H_2, CH_2OH, COOH, CHO and a sugar.

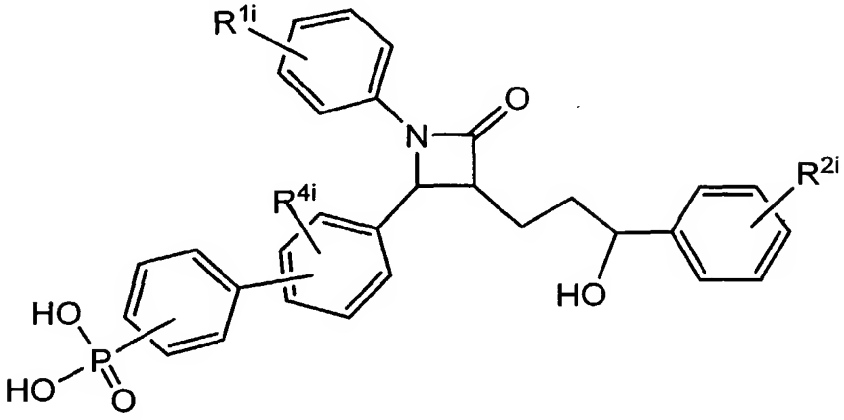
30. A compound according to claim 29 wherein R^{5i} is -OH of formula



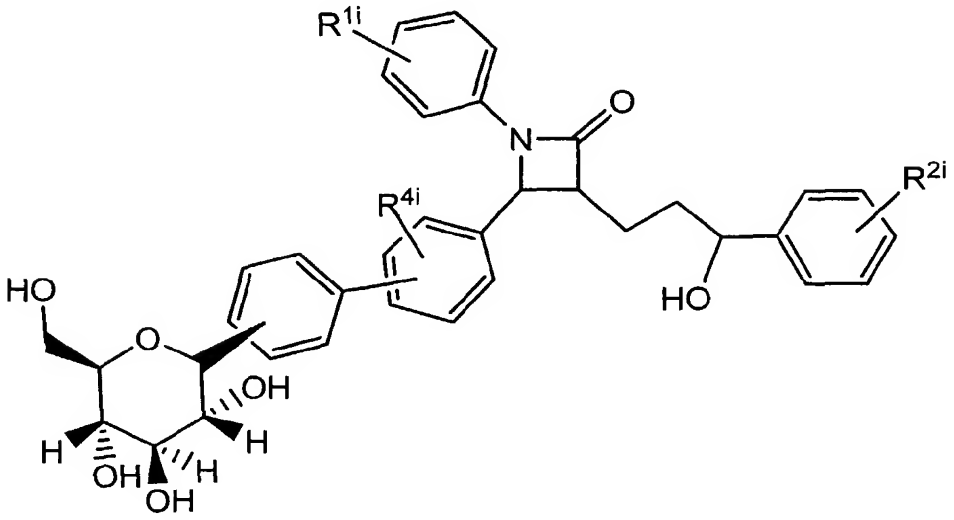
31. A compound according to claim 29 wherein R^{5i} is -SO_3H of formula



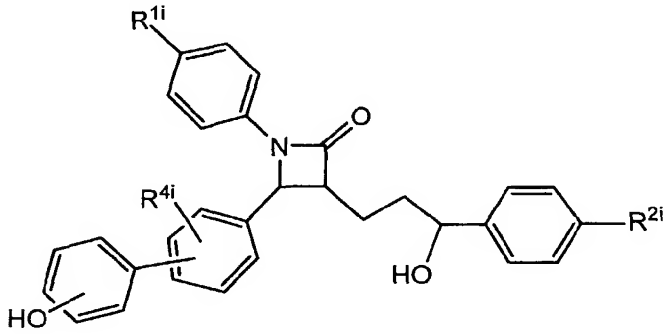
32. A compound according to claim 29 wherein R^{5i} is -PO_3H_2 of formula



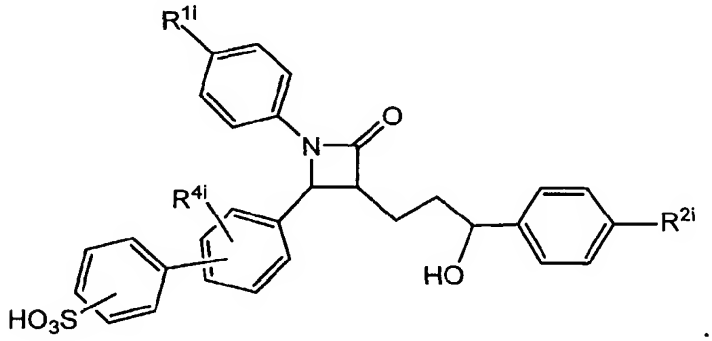
33. A compound according to claim 29 wherein R^{5i} is D-glucitol of formula



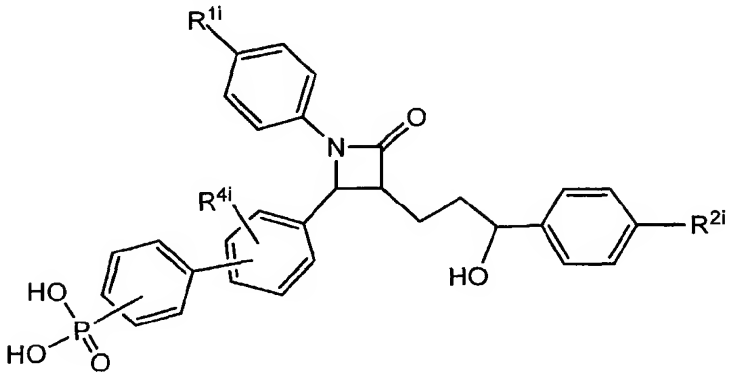
34. A compound according to claim 30 wherein R^{5i} is -OH of formula



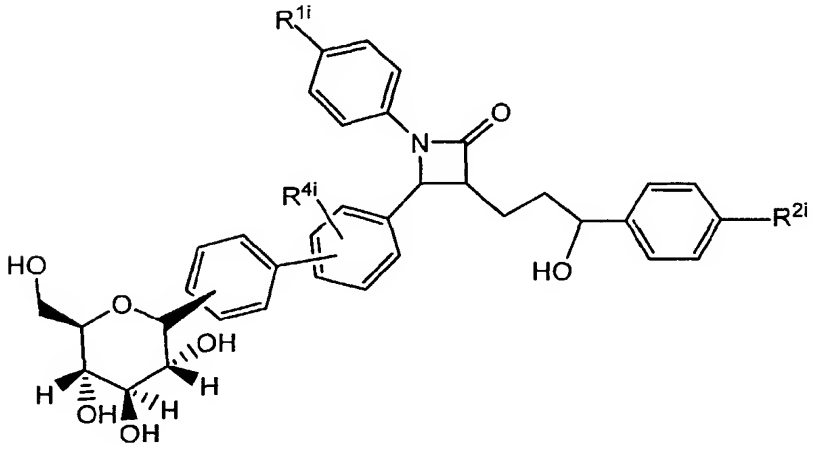
35. A compound according to claim 31 wherein R^{5i} is $-SO_3H$ of formula



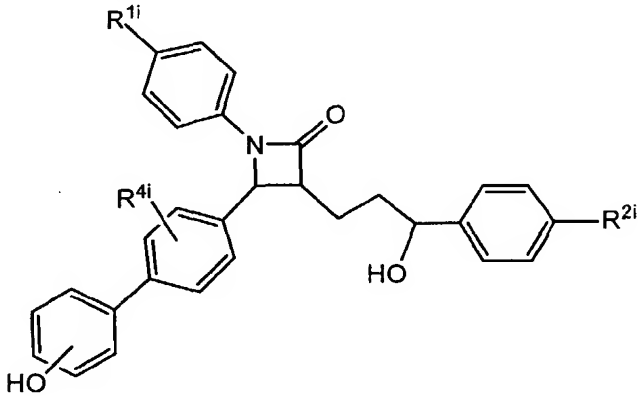
36. A compound according to claim 32 wherein R^{5i} is $-PO_3H_2$ of formula



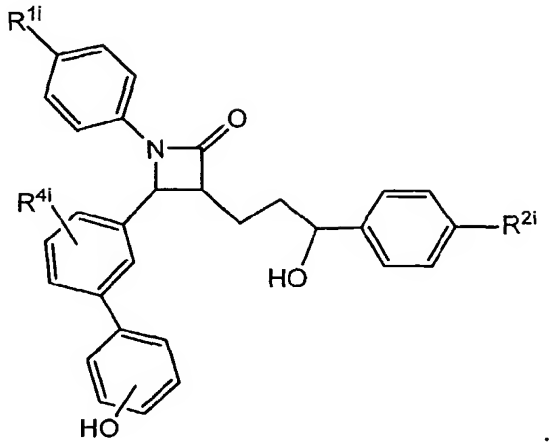
37. A compound according to claim 33 wherein R^{5i} is D-glucitol of formula



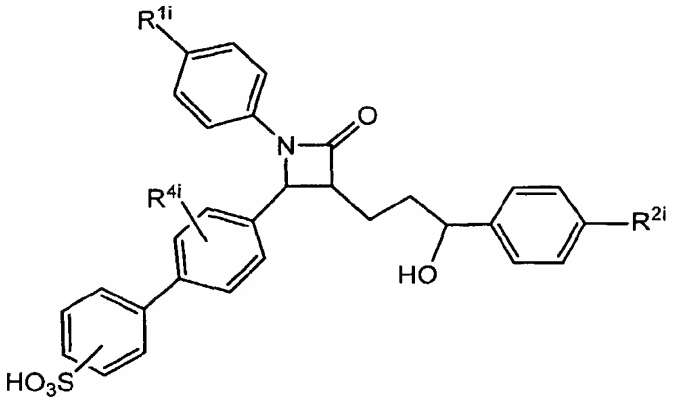
38. A compound according to claim 34 wherein R^{5i} is -OH of formula



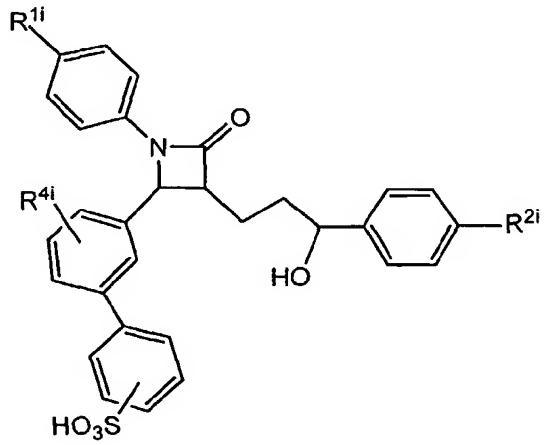
39. A compound according to claim 34 wherein R^{5i} is -OH of formula



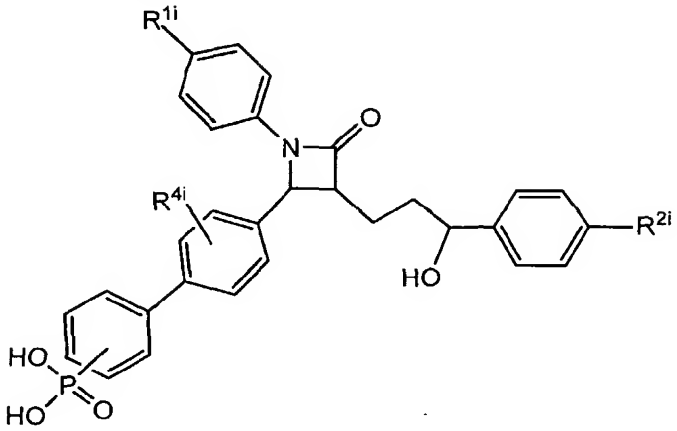
40. A compound according to claim 35 wherein R^{5i} is $-SO_3H$ of formula



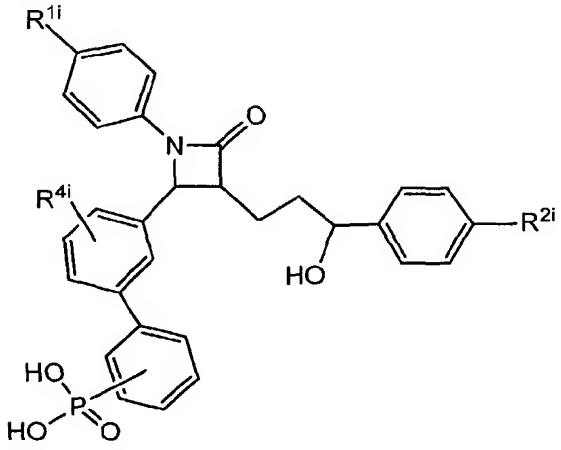
41. A compound according to claim 35 wherein R^{5i} is $-SO_3H$ of formula



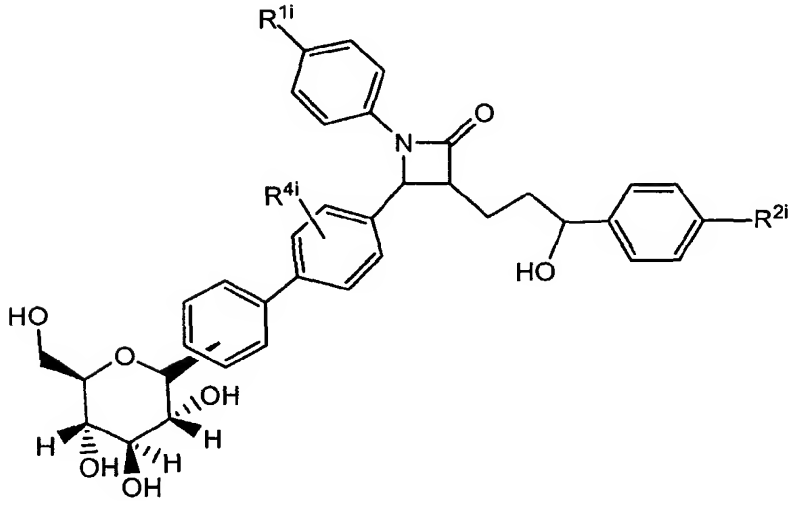
42. A compound according to claim 36 wherein R^{5i} is $-PO_3H_2$ of formula



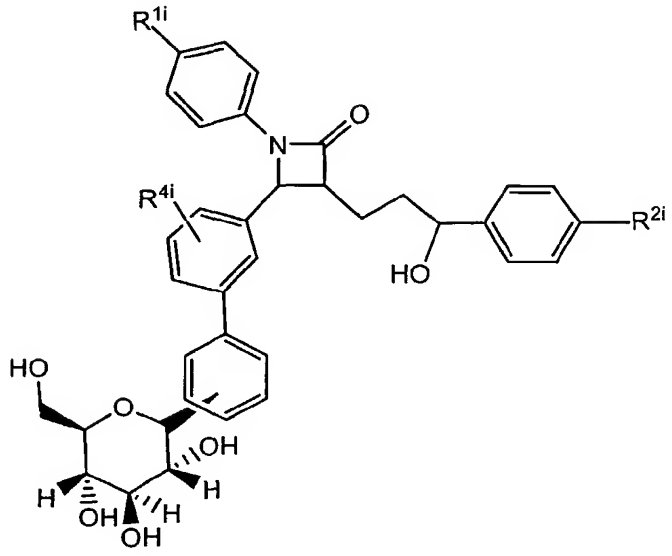
43. A compound according to claim 36 wherein R^{5i} is $-PO_3H_2$ of formula



44. A compound according to claim 37 wherein R^{5i} is D-glucitol of formula



45. A compound according to claim 37 wherein R^{5i} is D-glucitol of formula



46. A compound according to any of claims 29-45 wherein R^{4i} is OH.

47. A compound according to claim 46 wherein R^{4i} is ortho to the azetidine ring.

48. A compound according to any of claims 29-45 wherein R^{5i} is an ortho substituent.

49. A compound according to any of claims 29-45 wherein R^{5i} is a meta substituent.

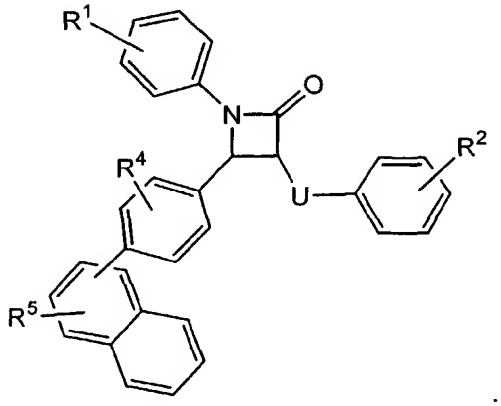
50. A compound according to any of claims 29-45 wherein R^{5i} is a para substituent.

51. A compound according to any of claims 29-45 wherein R^{1i} and R^{2i} are chosen from H, Cl and F.

52. A compound according to claim 51 wherein R^{1i} is H.

53. A compound according to claim 29 wherein said sugar is D-glucitol

54. A compound according to any of claims 1-4 of formula



55. A compound according to any of claims 1, 2, 3, or 29 wherein

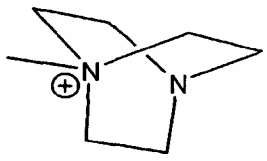
R^1 is H or 4-fluoro;

R^2 is 4-fluoro; and

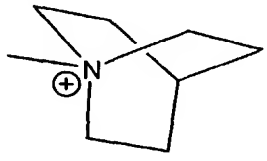
R^4 is H or hydroxy.

56. A compound according to claim 10 or 13 wherein one of R^1, R^4 and R^5 is -Q-A-$N^+R^9R^{10}R^{11}$ X^- -Q-A- is chosen from (C_2 to C_{20} hydrocarbon), -O-(C_2 to C_{20} hydrocarbon), -NH(C_2 to C_{20} hydrocarbon), -NHCO(C_2 to C_{20} hydrocarbon) and oxaalkyl of four to twenty carbons; R^9 is loweralkyl or benzyl and R^{10} and R^{11} are loweralkyl, or

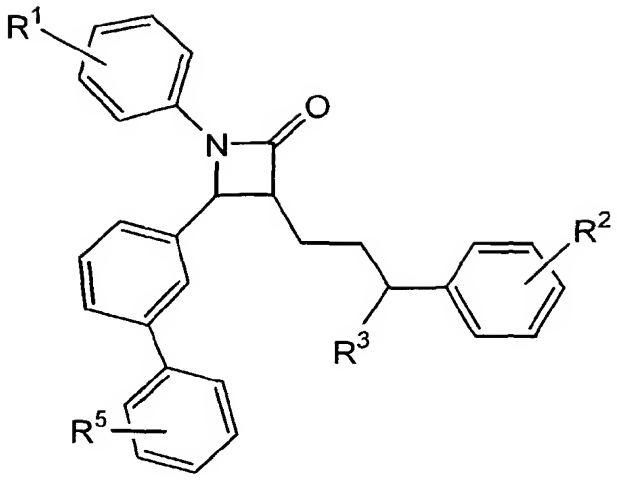
R^9,R^{10} and R^{11} taken together form a diazabicyclooctane quat:



or R^9,R^{10} and R^{11} taken together form a quinuclidinium quat:



57. A compound according to any of claims 1, 2, 9 or 12 of formula



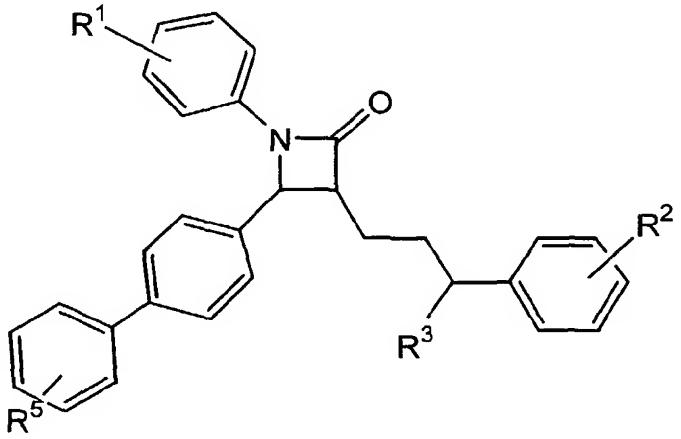
wherein

R^1 and R^2 are chosen from H, halogen, -OH, and methoxy;

R^3 is chosen from hydrogen and hydroxy; and

R^5 is chosen from halogen, hydroxy, loweralkyl, -O-loweralkyl, CF_3, alkylsulfonyl and arylsulfonyl.

58. A compound according to any of claims 1, 2, 9 or 12 of formula



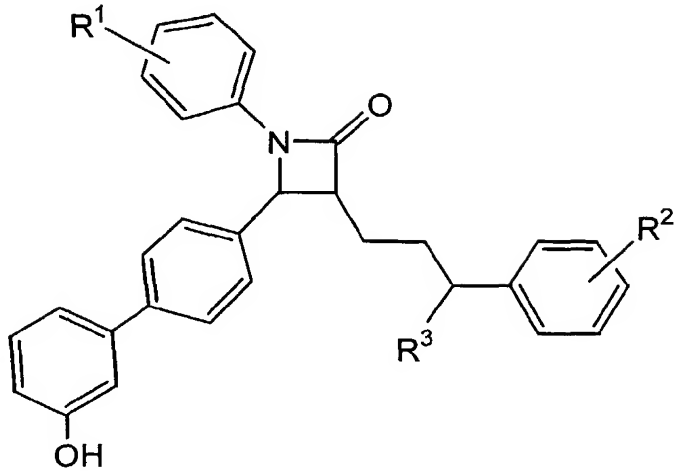
wherein

R^1 and R^2 are chosen from H, halogen, -OH, and methoxy;

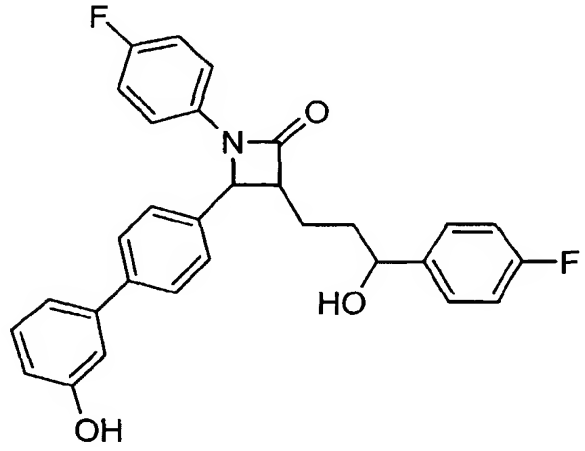
R^3 is chosen from hydrogen and hydroxy; and

R^5 is chosen from halogen, hydroxy, loweralkyl, -O-loweralkyl, CF_3, alkylsulfonyl and arylsulfonyl.

59. A compound according to claim 58 of formula



60. A compound according to claim 59 of formula



61. A compound according to claim 11 wherein

R^{1b} is R^{12} ;

R^{2b} and R^{4b} are chosen from H, halogen, -OH, and methoxy;

R^{12} is (C_6 to C_{20})alkylene-G in which one or more -CH_2- residues in said alkylene may be replaced by -O-, -NH-, -N(alkyl)-, -C(=O)- or -CH=CH-; and

G is chosen from -SO_3H, -PO_3H_2, a polyol, and a sugar.

62. A compound according to any of claims 11, 14 or 15 wherein

R^5 is R^{12} ;

R^1, R^2 and R^4 are chosen from H, halogen, -OH, and methoxy;
R^{12} is (C_6 to C_{20})alkylene-G in which one or more -CH_2- residues in said alkylene may be replaced by -O-, -NH-, -N(alkyl)-, -C(=O)- or -CH=CH-; and
G is chosen from -SO_3H, -PO_3H_2, a polyol, and a sugar.

63. A compound according to any of claims 1-4, 8-15 and 29-45 wherein the substituents at positions 3 and 4 of the azetidin-2-one are in a *cis* relative configuration.

64. A compound according to any of claims 1-4, 8-15 and 29-45 wherein the substituents at positions 3 and 4 of the azetidin-2-one are in a *trans* relative configuration.

65. A compound according to claim 64 wherein the substituent at position 3 of the azetidin-2-one is of the *R* absolute configuration and the substituent at position 4 of the azetidin-2-one is of the *S* absolute configuration.

66. A compound according to any of claims 1-3 wherein *U* is (C_2-C_6)-alkylene in which at least one -CH_2- is replaced by -CHOH-.

67. A compound chosen from the group consisting of:

(1) (1R)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-yl)-L-glucitol,
(2) (1S)-1,5-anhydro-1-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-L-glucitol,
(3) (1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol,
(4) (1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)-D-glucitol,
(5) (1S)-1,5-anhydro-1-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucitol,
(6) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(2',3',4'-trimethoxybiphenyl-4-yl)azetidin-2-one,

(7) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)azetidin-2-one,
(8) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-mercaptobiphenyl-4-yl)azetidin-2-one,
(9) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-methoxybiphenyl-4-yl)azetidin-2-one,
(10) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-nitrobiphenyl-4-yl)azetidin-2-one,
(11) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-hydroxy-3'-methoxybiphenyl-4-yl)azetidin-2-one,
(12) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(4'-vinylbiphenyl-4-yl)azetidin-2-one,
(13) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3'-(hydroxymethyl)biphenyl-4-yl]azetidin-2-one,
(14) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3'-(methylsulfonyl)biphenyl-4-yl]azetidin-2-one,
(15) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4-(2-naphthyl)phenyl]azetidin-2-one,
(16) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4'-(hydroxymethyl)biphenyl-4-yl]azetidin-2-one,
(17) (3R,4S)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[4'-(methylsulfonyl)biphenyl-4-yl]azetidin-2-one,
(18) (3R,4S)-1-biphenyl-4-yl-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)azetidin-2-one,
(19) (3R,4S)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-(3'-hydroxybiphenyl-4-yl)-1-phenylazetidin-2-one,
(20) (3R,4S)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-[3-hydroxy-3'-(methylsulfonyl)biphenyl-4-yl]-1-phenylazetidin-2-one,
(21) (3R,4S)-4-(2',3'-difluorobiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(22) (3R,4S)-4-(2',4'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,

(23) (3R,4S)-4-(2'-bromo-5'-hydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(24) (3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(25) (3R,4S)-4-(3,3'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one,
(26) (3R,4S)-4-(3,4'-dihydroxybiphenyl-4-yl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-1-phenylazetidin-2-one,
(27) (3R,4S)-4-(3',5'-dihydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(28) (3R,4S)-4-(3',5'-dimethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(29) (3R,4S)-4-(3'-butoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(30) (3R,4S)-4-(3'-ethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(31) (3R,4S)-4-(3'-fluoro-5'-hydroxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(32) (3R,4S)-4-(3'-fluoro-5'-methoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(33) (3R,4S)-4-(4'-aminobiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(34) (3R,4S)-4-(4'-ethoxybiphenyl-4-yl)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(35) (3R,4S)-4-[4-(2,3-dihydro-1,4-benzodioxin-6-yl)phenyl]-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(36) (3R,4S)-4-[4'-(dimethylamino)biphenyl-4-yl]-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]azetidin-2-one,
(37) (4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)boronic acid,
(38) (4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)phosphonic acid,

(39) (4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)phosphonic acid,

(40) (4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)boronic acid,

(41) (4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)phosphonic acid,

(42) (6R)-6-C-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose,

(43) (6R)-6-C-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose,

(44) (6S)-6-C-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucitol,

(45) (6S)-6-C-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-yl)-D-glucopyranose,

(46) (6S)-6-C-(4'-{(2S,3R)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose,

(47) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-3-hydroxybiphenyl-4-carboxylic acid,

(48) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-4-hydroxybiphenyl-3-carboxylic acid,

(49) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}-5-hydroxybiphenyl-2-carbaldehyde,

(50) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-carbaldehyde,

(51) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-carboxylic acid,

(52) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-sulfonic acid,

(53) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl β-L-glucopyranoside,

(54) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl β-L-glucopyranosiduronic acid,

(55) 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-carboxylic acid,
(56) 4'-{(2S,3R)-3-[3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-3-sulfonic acid,
(57) 6-O-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glucitol,
(58) 6-O-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-D-glucopyranose,
(59) methyl 4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-4-carboxylate,
(60) methyl 6-O-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)-a-D-glucopyranoside,
(61) N-(4'-{(2S,3R)-1-(4-fluorophenyl)-3-[(3S)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxoazetidin-2-yl}biphenyl-3-yl)acetamide,
(62) (4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-Fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-yl)phosphonic acid,
(63) 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonic acid; and
(64) sodium 4'-{(2*S*,3*R*)-3-[(3*S*)-3-(4-fluorophenyl)-3-hydroxypropyl]-4-oxo-1-phenylazetidin-2-yl}-3'-hydroxybiphenyl-4-sulfonate.

68. A compound according to any of claims 9-15 wherein X is a pharmaceutically acceptable anion.

69. A pharmaceutical formulation comprising a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 and a pharmaceutically acceptable carrier.

70. A pharmaceutical formulation according to claim 69 additionally comprising an inhibitor of cholesterol biosynthesis.

71. A pharmaceutical formulation according to claim 70 wherein said inhibitor of cholesterol biosynthesis is an HMG-CoA reductase inhibitor.

72. A pharmaceutical formulation according to claim 71 wherein said HMG-CoA reductase inhibitor is chosen from the group consisting of lovastatin, simvastatin, pravastatin, rosuvastatin, mevastatin, atorvastatin, cerivastatin, pitavastatin, fluvastatin, bervastatin, crilvastatin, carvastatin, rivastatin, sirrivastatin, glenvastatin and dalvastatin.

73. A pharmaceutical formulation according to claim 69 additionally comprising at least one bile acid sequestrant.

74. A pharmaceutical formulation according to claim 73 wherein the at least one bile acid sequestrant is selected from the group consisting of cholestyramine, colestipol, colesevelam hydrochloride and mixtures thereof.

75. A pharmaceutical formulation according to claim 69 additionally comprising at least one nicotinic acid or derivative thereof selected from the group consisting of nicotinic acid, niceritrol, nicofuranose, acipimox and mixtures thereof.

76. A pharmaceutical formulation according to claim 69 additionally comprising at least one peroxisome proliferator-activated receptor alpha activator.

77. A pharmaceutical formulation according to claim 76 wherein said peroxisome proliferator-activated receptor alpha activator is a fibric acid derivative.

78. A pharmaceutical formulation according to claim 77 wherein said fibric acid derivative is selected from the group consisting of fenofibrate, clofibrate, gemfibrozil, ciprofibrate, bezafibrate, clinofibrate, binifibrate, lifibrol and mixtures thereof.

79. A pharmaceutical formulation according to claim 69 additionally comprising at least one cholesterol ester transfer protein (CETP) inhibitor.

80. A pharmaceutical formulation according to claim 69 additionally comprising at least one obesity control medication.

81. A pharmaceutical formulation according to claim 69 additionally comprising at least one acylcoenzyme A:cholesterol acyltransferase (ACAT) inhibitor.

82. A pharmaceutical formulation according to claim 69 additionally comprising at least one hypoglycemic agent.

83. A pharmaceutical formulation according to claim 82 wherein the at least one hypoglycemic agent is a peroxisome proliferator activator receptor gamma agonist.

84. A pharmaceutical formulation according to claim 83 wherein the peroxisome proliferator activator receptor gamma agonist is selected from the group consisting of rosiglitazone, pioglitazone, or ciglitazone.

85. A pharmaceutical formulation according to claim 82 wherein the at least one hypoglycemic agent is an agent that decreases endogenous hepatic glucose production.

86. A pharmaceutical formulation according to claim 85 wherein the agent is metformin or phenformin.

87. A pharmaceutical formulation according to claim 82 wherein the at least one hypoglycemic agent is an agent that increases insulin release from the pancreas.

88. A pharmaceutical formulation according to claim 87 wherein the agent is carbutamide, tolbutamide, acetohexamide, tolazamide, chlorpropamide, glyburide [glibenclamide], glipizide, or gliclazide.

89. A pharmaceutical formulation according to claim 69 additionally comprising at least one antioxidant.

90. A pharmaceutical formulation according to claim 89 wherein the antioxidant is probucol or AGI-1067

91. An article of manufacture comprising a container, instructions, and a pharmaceutical formulation according to claim 69, wherein the instructions are for the administration of the pharmaceutical formulation for a purpose chosen from: the prevention or treatment of a disorder of lipid metabolism; reducing the plasma or tissue concentration of at least one non-cholesterol sterol or 5α-stanol; reducing the blood plasma or serum concentrations of LDL cholesterol; reducing the concentrations of cholesterol and cholesterol ester in the blood plasma or serum; increasing the fecal excretion of cholesterol; reducing the incidence of coronary heart disease-related events; reducing blood plasma or serum concentrations of C-reactive protein (CRP); treating or preventing vascular inflammation; reducing blood plasma or serum concentrations of triglycerides; increasing blood plasma or serum concentrations of HDL cholesterol; reducing blood plasma or serum concentrations of apolipoprotein B.

92. A pharmaceutical formulation according to claim 69 for the prevention or treatment of a cholesterol-associated tumor additionally comprising at least one other anticancer agent.

93. A pharmaceutical formulation according to claim 92 wherein at least one other anticancer agent is selected from the group consisting of a steroidal antiandrogen, a non-steroidal antiandrogen, an estrogen, diethylstilbestrol, a conjugated estrogen, a selective estrogen receptor modulator (SERM), a taxane, and a LHRH analog.

94. A pharmaceutical formulation according to claim 93 wherein the non-steroidal antiandrogen is selected from the group consisting of finasteride, flutamide, bicalutamide and nilutamide.

95. A pharmaceutical formulation according to claim 93 wherein the SERM is selected from the group consisting of tamoxifen, raloxifene, droloxifene, and idoxifene.

96. A pharmaceutical formulation according to claim 93 wherein the taxane is selected from the group consisting of paclitaxel and docetaxel.

97. A pharmaceutical formulation according to claim 93 wherein the LHRH analog is selected from the group consisting of goserelin acetate, and leuprolide acetate.

98. An article of manufacture comprising a container, instructions, and a pharmaceutical formulation according to claim 69, wherein the instructions are for the administration of the pharmaceutical formulation for a purpose chosen from: preventing, treating, or ameliorating symptoms of Alzheimer's Disease; regulating the production of amyloid β peptide; regulating the amount of ApoE isoform 4 in the bloodstream and/or brain; preventing or decreasing the incidence of xanthomas; and preventing or treating a cholesterol-associated tumor.

99. A pharmaceutical formulation according to claim 69 additionally comprising at least one antihypertensive compound.

100. A pharmaceutical formulation according to claim 99 wherein said antihypertensive compound is a thiazide derivative.

101. A pharmaceutical formulation according to claim 100 wherein said thiazide derivative is selected from the group consisting of hydrochlorothiazide, chlorothiazide, and polythiazide.

102. A pharmaceutical formulation according to claim 99 wherein said antihypertensive compound is a ß-adrenergic blocker.

103. A pharmaceutical formulation according to claim 102 wherein said ß-adrenergic blocker is selected from the group consisting of atenolol, metoprolol, propranolol, timolol, carvedilol, nadolol, and bisoprolol.

104. A pharmaceutical formulation according to claim 99 wherein said antihypertensive compound is a calcium-channel blocker.

105. A pharmaceutical formulation according to claim 104 wherein said calcium-channel blocker is selected from the group consisting of isradipine, verapamil, nitrendipine, amlodipine,nifedipine, nicardipine, isradipine, felodipine, nisoldipine, and diltiazem.

106. A pharmaceutical formulation according to claim 99 wherein said antihypertensive compound is an angiotensin-converting-enzyme (ACE) inhibitor.

107. A pharmaceutical formulation according to claim 106 wherein said angiotensin-converting-enzyme (ACE) inhibitor is selected from the group consisting of delapril, captopril, enalopril, lisinopril, quinapril, perindopril, benazepril, trandolapril, fosinopril, ramipril, and ceranapril.

108. A pharmaceutical formulation according to claim 99 wherein said antihypertensive compound is an angiotensin II receptor antagonist.

109. A pharmaceutical formulation according to claim 108 wherein said angiotensin II receptor antagonist is selected from the group consisting of candesartan, irbesartan, olmesartan, telmisartan, and aprosartan.

110. A method for treating a disorder of lipid metabolism comprising administering to a mammal a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67.

111. A method according to claim 110, wherein said disorder of lipid metabolism is hyperlipidemia.

112. A method according to claim 110, wherein said disorder of lipid metabolism is arteriosclerosis.

113. A method according to claim 110, wherein said disorder of lipid metabolism is sitosterolemia.

114. A method for inhibiting the absorption of cholesterol from the intestine of a mammal, which comprises administering an effective cholesterol-absorption-inhibiting amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

115. A method of reducing plasma or tissue concentration of at least one non-cholesterol sterol or 5α-stanol comprising administering to a mammal in need of such treatment an effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67.

116. A method for reducing the blood plasma or serum concentrations of LDL cholesterol in a mammal, which comprises administering an effective cholesterol reducing amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

117. A method for reducing the concentrations of cholesterol and cholesterol ester in the blood plasma or serum of a mammal, which comprises administering an effective cholesterol and cholesterol ester reducing amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

118. A method for increasing the fecal excretion of cholesterol in a mammal, which comprises administering an effective cholesterol fecal excretion increasing amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

119. A method for the prophylaxis or treatment of a clinical condition in a mammal, for which a cholesterol uptake inhibitor is indicated, which comprises administering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

120. A method for reducing the incidence of cardiovascular disease-related events in a mammal, which comprises administering an effective cardiovascular disease-related events reducing amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

121. A method for reducing blood plasma or serum concentrations of C-reactive protein (CRP) in a mammal, which comprises administering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

122. A method for treating or preventing vascular inflammation in a subject comprising administering a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to a subject having a level of C-reactive protein that indicates the presence of vascular inflammation or the potential for vascular inflammation.

123. A method for reducing blood plasma or serum concentrations of triglycerides in a mammal, which comprises administering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

124. A method for increasing blood plasma or serum concentrations of HDL cholesterol of a mammal, which comprises administering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

125. A method for reducing blood plasma or serum concentrations of apolipoprotein B in a mammal, which comprises administering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to the mammal.

126. A method of treating at least one vascular condition while preventing or minimizing muscular degenerative side effects associated with HMG-CoA reductase inhibitors, said method comprising administering to a subject in need thereof a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 in combination with at least one HMG-CoA reductase inhibitor.

127. A method of regulating the amount of ApoE isoform 4 in the bloodstream and/or brain of the subject comprising the step of administering to a subject in need of such treatment an effective amount of a composition comprising at least one compound represented by any of claims 1-4, 10-16, 22-44, 59 or 64.

128. A method of preventing, treating, or ameliorating symptoms of Alzheimer's Disease comprising the step of administering to a subject in need of such treatment an effective amount of a composition comprising a compound according to any of claims 1-4, 10-16, 22-44, 59 or 64.

129. A method of regulating the production of at least one amyloid β peptide in a subject or regulating a level of at least one amyloid β peptide in bloodstream and/or brain of a subject, comprising the step of administering to a subject in need of such treatment an effective amount of a composition comprising at least one compound represented by any of claims 1-4, 10-16, 22-44, 59 or 64.

130. A method of prevention or treatment of a cholesterol-associated tumor comprising administering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 to a patient at risk of developing a cholesterol-associated tumor or already exhibiting a cholesterol-associated tumor.

131. A method of prevention or treatment of a cholesterol-associated tumor according to claim 130 wherein the cholesterol-associated tumor is selected from the group consisting of benign prostatic hypertrophy, benign breast tumor, benign endometrial tumor, and benign colon tumor.

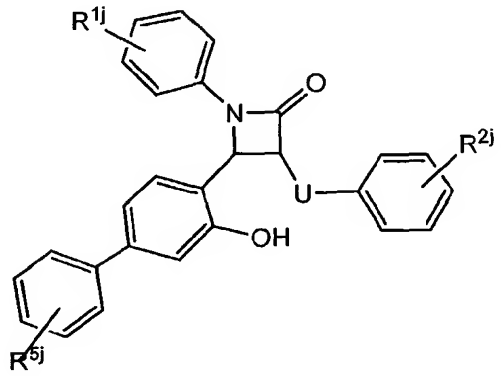
132. A method of prevention or treatment of a cholesterol-associated tumor according to claim 130 wherein the cholesterol-associated tumor is selected from the group consisting of malignant prostate tumor, breast cancer tumor, endometrial cancer tumor, and colon cancer tumor.

133. A method of prevention or treatment of a cholesterol-associated tumor comprising coadministering a therapeutically effective amount of a compound according to any of claims 1-4, 9-15, 29-45, 61 or 67 and at least one other anticancer agent to a patient at risk of developing a cholesterol-associated tumor or already exhibiting a cholesterol-associated tumor.

134. A method of prevention or treatment of a cholesterol-associated tumor comprising administering a pharmaceutical formulation according to claim 69 to a patient in need of such prevention or treatment.

135. A method of preventing or decreasing the incidence of xanthomas in a subject comprising administering to a subject in need of such treatment an effective amount of a compound according to any of claims 1-4, 10-16, 22-44, 59 or 64.

136. A compound of formula



wherein

U is (C_2-C_6)-alkylene in which one or more -CH_2- may be replaced by a radical chosen from -S-, -S(O)-, -SO_2-, -O-, -C(=O)-, -CHOH-, -NH-, CHF, CF_2, -CH(O-loweralkyl)-, -CH(O-loweracyl)-, -$CH(OSO_3H)$-, -$CH(OPO_3H_2)$-, -$CH(OB(OH)_2)$-, or -NOH-;

R^{1j} and R^{2j} are independently chosen from H, F and Cl; and

R^{5j} is chosen from SO_3H, PO_3H_2, a sugar and a gluconuride.

137. A compound according to claim 136 wherein R^{1j} is H.

138. A compound according to claim 136 wherein R^{2j} is F.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/037715

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C07D205/08 A61K31/397 A61P3/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C07D A61K A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	WO 02/066464 A (KOTOBUKI PHARMACEUTICAL CO., LTD; TOMIYAMA, HIROSHI; YOKOTA, MASAYUKI;) 29 August 2002 (2002-08-29) the whole document & EP 1 362 855 A (KOTOBUKI PHARMACEUTICAL CO., LTD) 19 November 2003 (2003-11-19)	1-138

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 March 2005	30/03/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lauro, P

INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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